BAL TASHCHIT:

THE JEWISH PROHIBITION AGAINST NEEDLESS DESTRUCTION

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To my wife, our children, and our parents

Preface

This is an interdisciplinary thesis. The second and third chapters focus on classic Jewish texts, commentary and legal responsa, including the original Hebrew and Aramaic, along with translations into English. The remainder of the thesis seeks to integrate principles derived from these Jewish sources with contemporary Western thought, particularly on what might be called 'environmental' themes. To facilitate this synthesis, we will follow a number of conventions as listed below.

1. In order to clearly distinguish between different sources and disciplines, the names of quoted authors will be preceded by a brief identifying 'title' such as "physicist" or "economist". Along these lines, the names of Rabbinic authorities will be preceded by: "R.".

2. Scriptural citations follow the translation of *The Holy Scriptures* by Koren Publishers, Jerusalem (2000) unless otherwise noted.

3. Non-scriptural citations (for example, from the Mishna, Talmud, Midrash, and Rabbinic Responsa) are translated by the author unless otherwise noted.

4. Where Hebrew words are transliterated into English, they are spelled according to the following convention:

    - ***ch*** (guttural *kh* sound) for the Hebrew letters ח and כ
    - ***tz*** for Hebrew letter צ
    - ***y*** for Hebrew letter י
    - ***k*** for the Hebrew letter ק
    - ***c*** for the Hebrew letter כ

5. The Jewish texts use many different names for "God", which can be very confusing. For the sake of consistency, I will use the term "Creator" to refer to: "God", "G-d", the "Lord", the "Holy One Blessed be He", etc, unless I am directly quoting from a published translation.

6. Direct quotations from another publication are written in *italics*. Within a quote, *words are emphasized by writing them in* standard *(Roman) script.*

7. For easy access to notes, I have provided footnotes on the same page as the reference, rather than endnotes. Where a non-English text is referenced in the footnotes, the title is either transliterated into English, or in some cases, translated into English. The language of the text is indicated in the Bibliography at the end of the thesis.

8. A guide to terms and abbreviations is provided at the end of the thesis.

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Chapter 1 - Introduction to *bal tashchit*

The natural environment[1] is the life support system for man in this world, from which he receives the resources[2] necessary for his survival, in which he lives, and into which he expels his wastes. Aside from the role the natural environment plays in the survival of man, the services it provides are an important element in the health and well-being of any society. Therefore, proper management of the natural environment - in order to make the best use of the resources and services it provides to man - is a vital concern.

Concern over the state of the natural environment and its effects on the human population has greatly increased over recent years. This concern has penetrated into nearly every realm of human experience, including the realm of what is commonly referred to as religion, or spirituality. One expression of this has been a growing interest in the relationship between traditional religions and the environment, particularly amongst those who are seeking ways of incorporating care for the environment into their religious practices. According to the European Forum for the Study of Religion and the Environment[3]: *There is a growing interest in the relationships between environmentally sustainable ways of living and established religious traditions, emerging trans-cultural and trans-local religious practices, and environmental spiritualities*.

One of the germane questions that can be asked about the relationship between religion and the environment is: what if any contributions can the religious traditions make towards the protection (and perhaps, even the improvement) of the quality of the natural environment? Most if not all of the tenets of established religious traditions were established long before the quality of the environment became known as an important international issue[4]. The environmental disciplines

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[1] The term 'natural environment' is deceptive in that it implies areas of wilderness untouched by man. In fact, as Kareiva writes : *Humans have so tamed nature that few locations in the world remain without human influence* (Kareiva et al. 2007, p.1866, which will be further discussed in the section 5.2.3.5) I use the term 'natural environment' to mean that part of man's environment which is not recognizably changed for the purposes of man. In other words, areas free of agriculture, industry or other human institutions. This, of course, is also misleading, because many practices, such as agroforestry, and many areas such as man-made wetlands don't clearly fit into either category. The unavoidable difficulties in defining what is 'natural' and what is not is already well-documented (for example, see Roald Hoffmann, Shira Leibowitz Schmidt, *Old Wine, New Flasks – Reflections on Science and Jewish Tradition*, (New York, 1997), pp.1-79). Further discussion on this interesting topic is beyond the scope of this thesis.

[2] Resources are defined as anything which provides benefit to man by satisfying his needs and wants. I will discuss the definition of resource in greater depth in chapter four (section 4.1). Natural resources are defined as physical resources that man takes from the 'natural' world, such as water or oil.

[3] European Forum for the Study of Religion and the Environment, available at: http://www.hf.ntnu.no/relnateur/index.php?lenke=about.php.

[4] This is not to say that environmental problems are by any means new. In his book *The Torah and the stoics on humankind and nature: a contribution to the debate on sustainability and quality (*p.22), Jan Boersema points out that: *At an early stage of development human societies were already confronted with the consequences of their actions, in the form of soil exhaustion, salinization, erosion and desertification… Of later date, but still centuries-old, is local pollution of the soil, water and air with toxic substances and substances in toxic quantities. The fact that we can nevertheless speak of a modern problem, despite its ultimately long history, is due in the first place to the enormous scale human environmental impact has assumed in our era and our likewise vastly expanded knowledge of the nature of that impact. But that is not all. Just as important, if not more so, is that this is now also increasingly regarded as a problem, with all the variation in problem formulation that implies.*

(such as environmental science, environmental management, ecology, and environmental economics) developed from other scientific disciplines at a time when the importance of religious tradition was already seriously waning in the developed world[5]. Therefore, there was little apparent interplay between the development of these disciplines and religious traditions, at least in the Western world.

Despite this lack of interplay, there is some suggestion that the Jewish tradition, in particular, can contribute towards the protection of environmental quality. Dutch scholar Jan Boersema finds a number of themes in the Hebrew Bible that he proposes might be advantageously adapted, in the Western world, in reformulating the relationship between man and his environment[6]. German scholar Aloys Hütterman writes[7]: "*The religious concepts of this small ancient society [the Jews] were the most important factor in the development of our civilization. We urgently need to adapt their ecological concepts in order to survive as human beings on our globe, which is now in the same situation as Eretz Yisrael [the land of Israel] was for the Jews, a tiny island in the universe where the limits of its resources are already visible".*

This thesis will examine one religious tenet from the Jewish tradition, known as *bal tashchit* or 'do not destroy'. *Bal tashchit*, which is increasingly mentioned in the context of contributions religious traditions can make towards addressing environmental issues, is derived from the following two verses in the book of Deuteronomy[8]:

> *When thou shalt besiege a city a long time, in making war against it to take it, thou shalt not destroy its trees by forcing an axe against them: for thou mayst eat of them, and thou shalt not cut them down; for is the tree of the field a man, that it should be besieged by thee? Only the trees which thou knowst that they be not trees for food, thou shalt destroy and cut them down; and thou shalt build bulwarks against the city that makes war with thee, until it be subdued.*

Bal tashchit is almost certainly the most important halachic[9] precept relating to the protection of the natural environment[10]. According to Jewish scholar R. Norman Lamm[11]: *The Biblical norm which most directly addresses itself to the ecological situation is that known as* bal taschit. Author Manfred Gerstenfeld writes[12]: Bal tashchit *is the halachic principle most frequently mentioned in contemporary Jewish publications to elaborate Judaism's attitude towards the environment.*

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[5] Ibid, p.236.
[6] Ibid, particularly the final chapter.
[7] Aloys Hütterman, *The Ecological Message of the Torah*, (Atlanta, 1999), p.204.
[8] Deuteronomy 20:19-20. These verses will be re-introduced in the original Hebrew, along with my own interpretive translation and analysis, in the following chapter.
[9] *Halachic* means pertaining to *halacha* (Jewish law).
[10] It is interesting to note however that many in the non-Jewish world seem to have largely missed the significance of *bal tashchit*. For example, the two studies earlier mentioned: *The Torah and the stoics on humankind and nature: a contribution to the debate on sustainability and quality* by Jan J.Boersema, and *The Ecological Message of the Torah* by Aloys Hütterman, both by non-Jewish academics who examined the Hebrew Bible from an environmental perspective, make no mention of *bal tashchit*. This despite the fact that both authors demonstrate significant knowledge of both the Hebrew Bible and the natural sciences, and each appreciates the Hebrew Bible as an underutilized source of environmental wisdom. The main reason for this omission, in my opinion, is the difference in how the Hebrew Bible is studied by traditional Jewish scholars, and other scholars, as will be discussed in the third chapter of this thesis.
[11] Norman Lamm, 'Thou Shalt Not Destroy', *Trees, Earth, and Torah: A Tu B'Shvat Anthology*, edited by Ari Elon, Naomi Mara Hyman and Arthur Waskow, (Philadelphia, 1999), p.106.
[12] Manfred Gerstenfeld, *Judaism, Environmentalism and the Environment:Mapping and Analysis*, (Jerusalem, 1998), p. 112.

Environmental educator, Eilon Schwartz writes[13]: *The Talmudic law* bal tashchit *("do not destroy") is the most predominant Jewish precept cited in contemporary Jewish writings on the environment…No single Jewish concept is quoted more often in demonstrating Judaism's environmental credentials than the Rabbinic concept of* bal tashchit. *It appears in virtually all of the literature that discusses Jewish attitudes toward the environmental crisis.* Legal scholar David Nir writes[14]: *The foremost environmental precept in traditional Judaism is known as* bal tashchit, *which is the Aramaic translation of the Hebrew Biblical injunction "do not destroy"*[15]*. Indeed, so fundamental is this maxim that one commentator has observed it would be no more possible to begin a discussion of Jewish environmental law without mentioning* bal tashchit *than it would be possible to explore the history of American constitutional law without referring to Marbury v. Madison*.

But, what exactly is *bal tashchit*? Like many religious tenets, *bal tashchit* has been subjected to a wide range of interpretations and claims. For example, economist Michael Szenberg writes[16], *This all-embracing principle "Do not wantonly destroy" encompasses both humankinds proper attitude toward inanimate objects and towards animals. Violation of this Biblical instruction contributes more to the environmental crisis than any other more eminently covered cause.* Claims like this, that *bal tashchit* is an "all-embracing principle" have rarely been substantiated through critical analysis of the source texts. On the other hand, Nir takes a far more minimalist position, writing[17]: *Regrettably, bal tashchit's ubiquity, if not overuse, has led to frequent misunderstandings of its origin, meaning, and purpose.* Nir later writes: Bal tashchit *may not function as the broad-based environmental ethic it is often mistakenly thought to be.*

In general, the more Torah-observant writers have restricted their examination to the practical *halacha* or Jewish law. Three such authors, R. Moshe Yitzchak Vorhand[18], R. Yitzchak Eliyahu Shtasman[19], both Ashkenazic Jews, and R. Simon Tov David[20], a Sephardic Jew, all published books on *bal tashchit* at the beginning of the new millennium. Each of these books was written in Hebrew for a limited, Torah-observant audience. To my knowledge they are the only books devoted solely to the subject of *bal tashchit* to be published either before or since. Remarkably, despite their exhaustive and lengthy analysis of the legal and ethical aspects of *bal tashchit*, none of these books make mention of the serious ecological problems facing the world, or even how the observance of *bal tashchit* could help address some of the more localized environmental problems facing the Torah-observant community.

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[13] Eilon Schwartz, 'Bal Tashchit: A Jewish Environmental Precept', *Environmental Ethics*, Vol. 18, (Winter 1997), p. 355.

[14] David Nir, 'A Critical Examination of the Jewish Environmental Law of Bal Taschchit – "Do Not Destroy"', *The Georgetown International Environmental Law Review*, vol. 18, Number 2, (Winter 2006), p.336.

[15] From early times, the Biblical prohibition of לא תשחית (lo tashchit) has been commonly referred to in the classic Jewish texts as בל תשחית (bal tashchit). In Rabbinic Hebrew, the prefix בל (bal) is often used in place of לא (lo). See for example, Marcus Jastrow, *A Dictionary of the Targumim, the Talmud Babli and Yerushalmi, and the Midrashic Literature*, (New York 1903), p.170. Nir is incorrect in calling *bal tashchit* the *Aramaic translation* of the Hebrew Biblical injunction "do not destroy". The term בל תשהית is Hebrew rather than Aramaic. The Aramaic translation for the Biblical לא תשחית is לא תחבל.

[16] Michael Szenberg, *Managing G-d's Estate: Current Environmental Policies and the Biblical Tradition*, Center for Applied Research, The Lubin School of Business, Pace University (U.S.), Working Papers, No. 152, March 1996, p. 3.

[17] Nir, (2006), p.335-353.

[18] R. Moshe Yitzchak Vorhand, *Birchat Hashem* (Jerusalem, 2000).

[19] R. Yitzchak Eliyahu Shtasman, *Aitz Hasadeh* (Jerusalem 2000).

[20] R. Siman Tov ben Dovid Dovid, *Al Pakhim Ketanim* (Tel Aviv, 2001).

A notable exception to the above was R. Samson Raphael Hirsch who lived in nineteenth century Germany and whose writings will be quoted extensively in the following chapters[21]. R. Hirsch, who was an eminent Torah scholar, and strictly observant of Torah law, wrote about *bal tashchit* with a passion and expansiveness that was, even for him, remarkable. For example, in the description of *bal taschit* published in his seminal book *Horeb*, Hirsch writes[22]: *And from this [the prohibition of* bal tashchit*] you should hear the warning of G-d: "Do not corrupt or destroy anything" and apply it to your whole life and to every being which is subordinated to you, from the earth which bears them all to the garment which you have already transformed into your cover. Do not corrupt or destroy anything is the first and most general call of The Creator, which comes to you, Man, when you realize yourself as master of the earth.*

Nir is very critical of R. Hirsch's position, as well as that of other, more contemporary and less Torah-observant writers who have expanded the scope of *bal tashchit* to encompass every and all environmental ills, but with little or no apparent basis in the Jewish legal sources[23]. Nir cites, for example, Eric Freudenstein who[24]: *describes* bal tashchit *as a "general prohibition against destroying the environment",* and Bradley Artson who: *stretches bal tashchit past all recognition, claiming that "[t]he mitzvah of [*bal tashchit*] is one that impels us to attend to live and the world as a single system, in which we are increasingly powerful – hence dangerous – participants. [*Bal tashchit*] is God's warning to be careful and to tread lightly."*

Translating between different systems of thought

The differences in portrayal of *bal tashchit* between the Torah-observant writers (with the exception of R. Hirsch) and the less traditional, more environmentally-oriented writers can be partially explained as a 'translation' problem. Each group is speaking about *bal tashchit*, but in different 'languages', so to speak, so that each could claim (as Nir, for example, does) that the other one is missing the point of what *bal tashchit* is meant to be. This relates to one of the challenges in defining and describing *bal tashchit* relative to current environmental problems, which is the difficulty of bridging the gaps between very different systems of thought. For example, Gerstenfeld writes[25]: *Judaism refers predominantly to how Jews should behave. Classical Judaism not only represents a much older world of thought than that of modern environmentalism: it is also a radically different one. This raises the question of how one can transpose concepts from one world of ideas to another, very different, one.* Schwartz also gives recognition to the difficulty of bridging this gap, and the necessity of understanding that different cultures have different ways of looking at the world, writing[26]: *It [*bal tashchit*] appears in virtually all of the literature that discusses Jewish attitudes toward the environmental crisis. Yet rarely are more than a few sentences given to actually explaining its history and its meaning. Such*

[21] Possible explanations for R. Hirsch's unusual interest in the natural world are discussed in the summary of the third chapter (section 3.5).

[22] R. Samson Raphael Hirsch, *Horeb, a Philosophy of Jewish Laws and Observances*, trans. I Grunfeld (New York, 1980), ch. 56, pp. 279-280.

[23] These authors are apparently basing themselves on the writings of R. Hirsch (though usually without any attribution). In fact, R. Hirsch was a renown Torah scholar who had a strong textual basis for his relatively extreme position on *bal tashchit*. Unfortunately, R. Hirsch doesn't expound on the sources for his position, and I find it doubtful that those authors who base their claims on his writings are aware of these sources. One of the things I will attempt to accomplish in this thesis, particularly in the second and third chapters, is to locate and expound on some of the probable sources for R. Hirsch's position.

[24] Nir (2006), p.349.

[25] Gerstenfeld (1998), p.3.

[26] Schwartz (1997), p.355-356.

a superficial approach has been relatively widespread in contemporary environmental ethics and its relation to traditional cultures. Advocates of a particular culture bring prooftexts to show that the culture is part of the solution; critics use it to show that the culture is part of the problem. Both approaches do little service to investigating a different cultural perspective from our own, one which is based on different philosophical assumptions debated in a different cultural language {…} only by entering the classical world of Jewish texts is it possible to transcend apologetics and get a glimpse of a traditional cultural perspective on its own terms. While recognizing the need to *'enter the classical world of Jewish texts'*, Schwartz's article falls short, in my opinion, of actually penetrating to a sufficiently deep understanding of *bal tashchit* to do justice to the contributions *bal tashchit* may be able to make to the world at large. The second and third chapters (as well as Appendix 1) of this thesis will attempt to take the reader through a deeper and broader examination of some of the classic Jewish texts upon which *bal tashchit* is based, and the remaining chapters will attempt to bridge some of the gaps between the different worldviews[27].

Deriving a principle of *bal tashchit*

The legal prohibition of *bal tashchit*, as described in the books by R. Vorhand, Shtasman and Simon Tov mentioned above, is very clearly-defined and built solidly on the classic Jewish texts. Nevertheless, this legal prohibition remains far too limited in scope to be applied to most current environmental problems, which transcend all or most traditional 'borders' (geographic as well as cultural). The 'all-embracing principle' described by R. Hirsch, Szenberg, and others is too vaguely defined to be of much practical use. What is needed, and what is still lacking, in my opinion, is a clearly defined *principle* of *bal tashchit* that is broad enough to be applied to a wide range of environmental problems, while remaining faithful to the classic Jewish sources upon which it must be based. By a principle, I mean a fundamental idea upon which other ones can be based and from which other ones can be derived. The methodology for deriving a principle, in the Jewish tradition, is described by contemporary legal scholar, R. Yitzchok Breitowitz as follows[28]: *Halachic reasoning, in common with all reasoning by analogy, involves a combination of inductive and deductive logic. First, relevant primary data - rulings in particular cases extracted from Talmud and [Jewish legal] Codes - have to be identified and collected. Second, through inductive reasoning, a hypothesis is formulated that explains the specific collection of rulings by reference to a more general* principle*. Third, through deductive reasoning, this* principle *can be utilized to apply to new situations that are not explicitly covered by the earlier rulings but can now be subsumed under the* principle *that is believed to explain those earlier rulings* (emphasis added).

Aims and Objectives

The aim of this thesis will be to answer the following three questions:

1. What exactly is *bal tashchit*?

[27] Nir, in my opinion, almost totally disregards the translational difficulties mentioned above, and attempts to fit the prohibition of *bal tashchit* into a modern western system of legal thought. Within this context, it is understandable that Nir concludes as I quoted him above that: *Regrettably,* bal tashchit's *ubiquity, if not overuse, has led to frequent misunderstandings of its origin, meaning, and purpose…* and later writes: Bal tashchit *may not function as the broad-based environmental ethic it is often mistakenly thought to be.*

[28] R. Yitzchok A. Breitowitz, *How A Rabbi Decides a Medical Halacha Issue*, Synopsis of Presentation given at the Conference on Jewish Medical Ethics, San Francisco, CA, February 18-20, 1996. Available at: http://www.jlaw.com/Articles/decide.html.

2. How, if at all, can *bal tashchit* be applied to current environmental problems?

3. What, if anything, can *bal tashchit* contribute to our current understanding and ability to manage our natural environment?

In order to answer these questions I will take the following approach:

In chapter two I will examine Deuteronomy 20:19-20 in the Hebrew Bible, from which *bal tashchit* is derived. This will include an analysis of the verses themselves, as well as the commentary that developed around them.

In the third chapter I will investigate the prohibition of *bal tashchit* in the classic Jewish texts, working chronologically from the earliest recorded sources until the modern era. My rationale in doing this is, first of all, to ensure a comprehensive survey of legal rulings from which to form a principle (as described above by R. Breitowitz) of *bal tashchit*. Additionally, this will provide a chronological perspective on *bal tashchit*, which may indicate how the principle is affected by the different circumstances experienced by Jewish communities over time.

In the fourth chapter I will attempt to develop a general *principle* of *bal tashchit* by integrating the findings of the second and third chapters with more modern concepts in environmental management.

In the fifth chapter I will further develop and clarify a general principle of *bal tashchit*, in terms of a hierarchical model that can be applied to current problems.

In the sixth chapter, I will apply the general principle of *bal tashchit* to an important current environmental problem – the management of fresh water resources in Israel.

Finally, in chapter seven I will evaluate and discuss what can be learned from this exercise and what a principle of *bal tashchit* can contribute to the modern world.

Three appendices are added to supplement these chapters. To help address the problem of translating between different systems of thought, the first appendix describes underlying assumptions in the Jewish tradition upon which *bal tashchit* should be understood. The second appendix provides brief backgrounds of the authors of the classic Jewish texts used in this thesis. The third appendix examines the principle of *bal tashchit* as an explanatory tool for approaching the remarkable debate between those who believe that man is rapidly destroying his environment/life-support system and those who disagree.

Methodological Approach

In the second and third chapters, and in the remainder of this thesis where Jewish texts are examined, my methodological approach is to examine these texts from the perspective of Jewish tradition, rather than from the perspective of an academic or a historian. My aim is to formulate a principle of *bal tashchit* that remains faithful to Jewish tradition. Therefore, anything in this thesis appearing novel or innovative should be solidly grounded in the classic Jewish texts.

For example, in traditional Judaism, the text of the *Tanach* or Hebrew Bible is never studied without the accompaniment of the commentaries and the *oral tradition* upon which these

commentaries are usually based.[29] Other approaches to learning the Hebrew Bible, without the Jewish oral tradition, will bring different conclusions. On the one hand, this allows more freedom for some creative and eco-friendly interpretations. On the other hand, it excludes the participation of those who are adherents to Jewish tradition, and can result in the omission of significant principles in the Jewish tradition such as *bal tashchit*[30].

[29] The Tanach as well as the oral tradition will be introduced in the third chapter (section 3.1)
[30] See footnote 10 above.

Chapter 2. Analysis and Discussion of Deuteronomy 20:19-20

The previous chapter introduced the prohibition of *bal tashchit*, and its Biblical source in Deuteronomy 20:19-20:

כי תצור אל עיר ימים רבים להלחם עליו לתפשה, לא תשחית את עצה לנדח עליו גרזן, כי ממנו תאכל ואתו לא תכרות, כי האדם עץ השדה לבא מפניך במצור. רק עץ אשר תדע כי לא עץ מאכל הוא אותו תשחית וכרתה ובניתה מצור על העיר אשר היא עשה מלחמה עד רדתה. (דברים כ':יט)

> *When thou shalt besiege a city a long time, in making war against it to take it, thou shalt not destroy its trees by forcing an axe against them: for thou mayst eat of them, and thou shalt not cut them down; for is the tree of the field a man, that it should be besieged by thee? Only the trees which thou knowst that they be not trees for food, thou shalt destroy and cut them down; and thou shalt build bulwarks against the city that makes war with thee, until it be subdued.*

The aim of this chapter is to closely examine Deuteronomy 20:19-20 and the commentaries that developed around it, in order to form a better understanding of *bal tashchit* in its Biblical source[31]. This will include:

1. Analysis of Deuteronomy 20:19-20

2. Study of classic Jewish commentaries on Deuteronomy 20:19-20 - particularly the emphasis in this verse on trees and on the comparison of trees to humans.

3. Interpretation of the findings

2.1 Analysis of Deuteronomy 20:19-20

Translation of Deuteronomy 20:19 into English

The translation provided above follows the *Koren Tanach*, which is used throughout this thesis. The Koren translation interprets the end of verse 19: כי האדם עץ השדה לבא מפניך במצור as a rhetorical question: *for is the tree of the field a man, that it should be besieged by thee?* As I will discuss below (section 2.2), I prefer to interpret these words in the manner of the majority of the major Biblical commentators in the Jewish tradition, as a statement rather than a rhetorical question. Therefore, before proceeding to a more detailed analysis, I will modify the Koren translation of verse 19 to the following:

When thou shalt besiege a city a long time, in making war against it to take it, thou shalt not destroy its trees by forcing an axe against them: for thou mayst eat of them, and thou shalt not cut them down – for man is a tree of the field – to bring [the city] before thee in a siege.

[31] In classical Jewish learning, Scriptural verses are analyzed in connection with the commentaries and the Oral law upon which the commentaries are often based. It would be misleading to analyze the Biblical text alone, for this would fail to provide an understanding of normative Jewish thought regarding *bal tashchit*.

Deuteronomy 20:19-20 contains a number of interesting elements – particularly relating to the context of the verse and the choice of words – that require further elucidation. This section will address these elements according to the order in which they are written.

כי תצור אל עיר ימים רבים להלחם עליו לתפשה

When thou shalt besiege a city a long time, in making war against it to take it

The prohibition against needless destruction (*bal tashchit*) is taught in the context of a military campaign. The significance of this contextual setting, some commentaries suggest, is to demonstrate that even in the most extreme and destructive situations, the Torah commands its adherents to limit destruction[32]. The fact that this is taught in the context of an *offensive* siege only strengthens the point. In defending its own territory, a people can be expected to minimize environmental destruction – the consequences of which they would have to suffer in the future. For an attacking army, whose goal is to demoralize and starve the besieged enemy, it can be advantageous to destroy the enemy's natural resources. Nevertheless, the Torah commands the exercise of restraint. Using an exegetical principle known as *'kal v'chomer'* (learning from a less likely case to a more likely case[33]), the Torah describes the least likely case where needless destruction would be prohibited (warfare) and prohibits it even there – proving that needless destruction would certainly be prohibited in all other cases.

לא תשחית את עצה

thou shalt not destroy (lo tashchit) its trees

The question is on the choice of Hebrew word שחת *(shachat) as* in לא תשחית *("lo tashchit")* to denote *'destruction'*. In the Hebrew language, there are a number of other synonyms for *destruction*, including: אבד *(abed)*, הרוס (*haros)*, כלות (*kalot)*, and חרב (*charev)*. Each of these words has its own special connotations in relation to destruction. Why was the word *shachat* (Hebraic root of *tashchit)* selected?

The word *shachat* in Biblical Hebrew is synonymous with *kilkul*[34] (קלקול) which translates as spoil or corrupt[35]. This is similar to the translation of *shachat* in modern Hebrew as[36] *to: spoil, hurt, waste; to ruin, destroy; to sin, act basely (corruptly); to kill.* In the words of R. Samson Raphael Hirsch (1808-1888), who bases much of his commentary on an analysis of the etymology of Biblical Hebrew[37]:

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[32] See for example Nachmanides, *Peirushei haTorah leRabbeinu Moshe ben Nachman*, ed. Chaim Dov Chavel (Jerusalem, 1960), vol. 2, pp. 438-439 (Deut. 20:19). According to R. Shneur Zalman of Liadi - *Shulchan Aruch HaRav* (New York, 1974), sect. 6, *Hilchot Shmirat HaNefesh v'HaGuf v'Bal Tashchit* 14, p. 1775. – the reason the Torah writes this prohibition in the context of a war is in order to teach that even at this time one shouldn't destroy a fruit tree if there are non-fruit trees available that can be used instead of the fruit tree.

[33] The more familiar Latin term for this is *a fortiori*.

[34] Shvil, *Condordantia l'Tanach*, (Tel Aviv, 1968), p.684.

[35] Reuven Alcalay, *The Complete Hebrew-English Dictionary*, New Enlarged Edition, vol. 2, (Tel Aviv, 1996), p.2297.

[36] Ibid, p.2590.

[37] R. Samson Raphael Hirsch, *The Pentateuch, translated and explained*, trans. Isaac Levy (Gateshead, 1982), vol. 1, pp.138-139, on Gen. 6:11.

שחת [the root of the word tashchit] is the conception of corruption, not destruction. It is the overthrow of a good condition, and the impeding of progress, and the changing into the opposite of anything which was meant to thrive and prosper. The basic meaning of שחת is a pit, and not with any idea of its being used to preserve things, but as a means of interrupting the path of somebody striving towards his goal, and bringing him to destruction. It is related to שחד*: bribery, which is a pit dug in the path of a judge on his way to delivering a true and just verdict, and also to* שחט *[slaughter] which interrupts the progress of the life of an animal. From this basic meaning of* שחת *we can understand why it is preferably connected with* דרך *[way or path].* השחתה *in general means to be interrupted on the way to prosperity.* השחית הדרך *[corruption of the path], presupposes that the whole path of life, also that directed to the sensual, in itself only leads to moral welfare. Immorality is the pit which diverts the direction, in itself so good, into corruption.*

Shachat is distinguished by its connotations of corruption and spoilage or degradation. Hirsch's explanation of the word *shachat* also reveals an underlying positivist worldview in which the created world and everything in it has a constructive purpose and moral destiny, and that there is a moral requirement to use all resources for the proper purpose, lest they be corrupted and prevented from reaching their destiny (this concept will be further developed in Appendix A).

לנדח עליו גרזן

by forcing an axe against them

On these words, R. Hirsch writes[38]: *where nothing but destruction is achieved or purposed*, suggesting that the inclusion of these words implies a *needless* destruction. The image presented by Hirsch is of carelessly swinging an axe against a tree with no constructive purpose.

כי ממנו תאכל ואתו לא תכרות

for thou mayst eat of them, and thou shalt not cut them down

From these words, the Sifrei (the halachic Midrash on the books of Numbers and Deuteronomy, compiled in the period of the Tannaim – roughly 100 B.C.E. to 200 C.E.) derives two separate mitzvot or religious duties[39]:

כי ממנו תאכל, מצות עשה ואותו לא תכרת, מצות לא תעשה

> *'For thou mayst eat of them' – this is a positive mitzva; and 'thou shalt not cut them down' – this is a negative mitzva.*

Similarly, Hirsch writes[40]: *[This] would be the command to maintain, and the prohibition to cut down fruit trees.*

These words also bring to mind the concept of sustainability. While the fruits may be consumed, the producers of the fruits must be preserved to provide for the future. This concept will be further discussed below in section 2.2.1.

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[38] R. Hirsch, *Pentateuch*, vol. 5, p.395 (Deut. 20:19).
[39] *Sifrei on the book of Deuteronomy*, ed. Eliezer Arieh Finkelstein (New York and Jerusalem, 1993), p. 239 (piska 203).
[40] R. Hirsch, *Pentateuch*, vol. 5, p.394 (Deut. 20:19).

כי האדם עץ השדה

for man is a tree of the field

These words present two interesting concepts. The first concept is the comparison of man to a [fruit-producing] *tree*. The Jewish sources, and in particular, the writings of the prophets, are rich in symbolism – containing many symbolic comparisons between individuals, tribes, or nations with natural objects. For example, amongst the Israelite tribes, Judah is compared to a lion[41], Benjamin to a wolf[42], and Naftali to a deer[43]. The collective Jewish people are often compared to a dove[44]. Foreign nations are sometimes compared to a pig[45], or a bear[46] or a specific type of tree, for example: *Assyria was a cedar in Lebanon...*[47]

However, in the Jewish sources, it appears that the only natural object to which mankind is collectively compared, is the fruit-producing tree of Deuteronomy 20:19.
The second concept is the use of the words *tree of the field*, as opposed to just *tree*, or *tree of the forest*. What is the significance of a '*field*'? Does this imply that a tree in any other location is not like man?

A *field* (שדה in Hebrew) can be defined as an area of land modified by humans to enhance its ability to produce benefit. This modification can include plowing, fertilizing, irrigating, terracing and clearing away of stones, undesired plants or animals; all of which help make the area more useable to man.

In his etymology of Biblical Hebrew, R. Hirsch relates the word *sadeh* (שדה) to the Hebrew word for breast (שד)[48]. A breast is a conduit for supplying nourishment – in this case milk to a nursing infant. According to this interpretation, a tree of the field (as opposed to a tree of the wilderness) can be taken to mean a conduit for supplying nourishment or other benefit, and which requires cultivation, nurturing and care. In other words, the word 'field' implies the need for proper nurturing and attention from man, as opposed to something that grows wildly on its own. It also seems to imply an area prepared by man in such a way as to maximize its productive capacity and the quality of the resources produced.

According to the Jerusalem Talmud, a *field* also implies something *outside* where it is likely to be directly exposed to the sun and the elements[49]:

ר' יוחנן בשם ר' ינאי אילן שנטעו בתוך הבית חייב בערלה ופטור מן המעשרות דכתיב עשר תעשר את כל תבואת זרעך היוצא *השדה* - (תלמוד ירושלמי מסכת ערלה פרק א דף סא טור א /ה"ב)

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[41] Genesis 49:9
[42] ibid 49:27
[43] ibid 49:21
[44] R. Shim'on HaDarshan of Frankfurt, *Yalkut Shim'oni*, ed. B.B. Boruchman (Jerusalem, 2006, reprint of Warsaw, 1878), vol. 3, Shir HaShirim 986 (on Song of Songs 2:14), p. 248; *Midrash Tanchuma* (Bnei Braq, 1998), [vol.1], Tetzaveh 5, p.153.
[45] The nation of Edom is compared to a pig in *Leviticus Rabbah* (Vilna, 1878), vol. 2, sect. 13:5, p. 37.
[46] The ancient nation of Persia is compared to a bear in the Talmud (B.T. Megilla 11a).
[47] Ezekiel 31:3-9.
[48] R. Hirsch, *Pentateuch*, vol. 1, pp. 51-52 (Gen. 2:5).
[49] J.T. Orlah, 1:2

> *R. Yochanan said in the name of R. Yannai, a tree that is planted inside a house [or other covered area] is obligated in orlah[50] and exempt from tithing[51], as it says: "tithe all the produce of your seed that comes out of the* field*"(emphasis added).*

While the word *field* is used in connection with *tithing*, as shown above, the word *eretz*[52] or land is used in connection with *orlah*, implying everything that grows in the earth, even that which grows under a covered area. In other words, *land* implies everywhere in the land of Israel and *field* implies only that which grows *outside.*

Therefore, *sadeh* or *field* contains the elements of care and nurturing as well as unhindered exposure to the sun (which is the source of energy). Comparing a human to a *tree of the field* seems to imply that in order to produce 'fruits' a human requires proper care and nurturing as well as some unencumbered access to outside elements[53].

לבא מפניך במצור

to bring [the city] before thee in a siege.

These words present an interesting problem. As will be discussed below (section 2.2), the Biblical commentators disagree whether to read these words as part of a rhetorical question or as a statement. If these words are understood as part of a rhetorical question, then the meaning is clear: *is the tree of the field a man, that it should be besieged by thee?* In other words, your war is with humans, why should the trees suffer? If, however, this sentence is understood as a statement (as most Hebrew commentators suggest) then the end of the sentence – *for man is a tree of the field to bring [the city] before thee in a siege* sounds forced to the point of being incomprehensible. We can also ask, why the emphasis in this verse on the concept of a 'siege', which is used twice in this verse?[54]

Of the majority of classical commentators who interpret this verse as a statement (see section 2.2 below), I prefer the interpretation of R. Avraham Ibn Ezra (1089-1167) who writes[55]:

וזה פירושו, כי ממנו תאכל ואותו לא תכרות, כי האדם עץ השדה, והטעם: כי חיי בן אדם הוא עץ השדה. וכמוהו: כי נפש הוא חובל (דברים כד, ו), כי חיי נפש הוא חובל. ואותו לא תכרות. דבק עם לבא מפניך במצור. הנה לא תשחית עץ פרי שהוא חיים לבן אדם, רק מותר שתאכל ממנו, ואסור לך להשחיתו כדי שתבא העיר מפניך במצור. (אבן עזרא דברים פרק כ פסוק יט)

> *And this is the interpretation [of this verse]: "you should eat from it and don't cut it down, because man is a tree of the field". And the explanation is: the life of a man is [from] a tree of the field… "and don't cut it down" is attached to "to come before you in a siege". [Meaning] don't destroy a fruit tree, which is [a contributor to] the life for man; it is only permitted to eat from it, and forbidden to destroy it in order that the city will come before you in a siege.*

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[50] Orlah is a Biblical law (Leviticus 19:23) prohibiting the consumption of fruits produced by a tree during the first three years of the growth of the trees.

[51] Tithing is also a Biblical law (Leviticus 27:30) requiring a farmer to apportion one tenth of the produce of his fields to the Levites and to the poor.

[52] וְכִי תָבֹאוּ אֶל־הָאָרֶץ וּנְטַעְתֶּם כָּל עֵץ מַאֲכָל וַעֲרַלְתֶּם עָרְלָתוֹ אֶת פִּרְיוֹ שָׁלֹשׁ שָׁנִים יִהְיֶה לָכֶם עֲרֵלִים לֹא יֵאָכֵל׃

[53] The importance of this exposure to the 'elements' will be discussed in chapter 4 (section 4.4).

[54] An attempt to answer these questions in line with ideas introduced in the fourth chapter, appears in section 4.3.6.

[55] *Torat Chayim*, Deut: Ibn Ezra, pp. 174 (Deut. 20:19). Ibn Ezra is apparently quoting from an earlier source, the Sifrei, listed above.

R. Ibn Ezra's interpretation juxtaposes the words of this verse to connect the last three words "to bring before thee in a siege" with the prohibition of cutting down fruit trees. He places the words "for man is a tree of the field" as an aside, explaining why a fruit tree must not be destroyed, but not really part of the flow of the sentence.[56]

רק עץ אשר תדע כי לא עץ מאכל הוא אותו תשחית וכרתה ובניתה מצור על העיר אשר היא עשה מלחמה עד רדתה

> *Only the trees which thou knowst that they be not trees for food, thou shalt destroy and cut them down; and thou shalt build bulwarks against the city that makes war with thee, until it be subdued.*

This verse – Deuteronomy 20:20 – functions as a qualifier to the previous verse, establishing that only 'trees for food' are protected. Trees that are not for food (לא עץ מאכל הוא) may be cut down for building a siege. Furthermore, this verse establishes that one is permitted to cut down trees only if *thou knowst* (אשר תדע) that it in fact they are not fruit-producing. Therefore, in cases of doubt, one is not permitted to destroy the trees.

While Koren translates the words עץ מאכל as *'trees for food'*, I prefer to translate these words, as 'fruit-producing' trees, which, in my opinion, gives a clearer, more conventional understanding of trees that produces edible fruits for man.

The words עץ and מאכל have deeper connotations in the Jewish tradition than their literal translations. While the word עץ is commonly translated as 'tree', or 'wood', עץ is sometimes used to represent something quite different from the literal meaning of 'tree' or 'wood'. For example, the Torah is often referred to as עץ חיים or 'tree of life[57]'. Genesis 2:9 describes the עץ החיים בתוך הגן ועץ הדעת טוב ורע , the *tree of life also in the midst of the garden, and the tree of the knowledge of good and evil*. Clearly, the עץ being described here is something other than 'tree' in the conventional form. In my opinion, the word עץ is being used here to also denote a *conduit* through which something desired can be obtained. For example, when Jewish tradition call the Torah an עץ חיים it is describing the Torah as a conduit through which [eternal] life can be obtained. Similarly, according to this interpretation, the עץ הדעת טוב ורע was a conduit through which the 'knowledge of good and evil' could be obtained.

The word מאכל also has wider connotations than the simple translation of *'for food'*. In the Jewish tradition, the word אכילה connotes not only *eating*, but in a much broader sense, the same word can include any *benefit* that man derives from something[58]. Therefore, עץ מאכל or 'trees for food' can be interpreted more broadly as *conduits through which man can derive benefits*. This

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[56] Interestingly, the *King James Bible* interprets the phrase in much the same way as R. Avraham Ibn Ezra, translating the verse as follows: *When thou shalt besiege a city a long time, in making war against it to take it, thou shalt not destroy the trees thereof by forcing an axe against them: for thou mayest eat of them, and thou shalt not cut them down (for the tree of the field is man's life) to employ them in the siege*. See: *Open Bible – Authorized King James Version* (Lynchburg, Virginia, 1975), p. 193: (Deut 20:19). Also available at: http://quod.lib.umich.edu/k/kjv/

[57] For example, see Maimonides, Laws of Repentence, 9:1
הקב"ה נתן לנו תורה זו עץ חיים היא (רמב"ם הלכות תשובה פרק ט הלכה א)

[58] For example, see T.B. Pesachim 32b, which discusses how the Torah prohibition against eating certain foods is meant to include not only eating, but any type of benefit.
לעולם לא יאכל - איסור אכילה ואיסור הנאה משמע. (תלמוד בבלי מסכת פסחים כב:)

interpretation will be especially relevant to chapter 4 where it will be further discussed (see section 4.3).

2.2 Analysis of the Biblical verse comparing man and trees in the classic Jewish commentaries

Many of the classical Biblical commentators (as will be discussed below) draw attention to the apparent comparison between man and trees in Deuteronomy 20:19 – כי האדם עץ ה שדה (*because man is a tree of the field*). A minority of the commentators[59] avoid comparing trees and humans by interpreting the verse as a rhetorical question: *is a tree of the field human?* For example, R. Shlomo ben Yitzchak (1040-1105), more commonly referred to under the acronym of *Rashi*, writes:

כי האדם עץ השדה - הרי כי משמש בלשון דלמא . שמא האדם עץ השדה להכנס בתוך המצור מפניך להתייסר ביסורי רעב וצמא כאנשי העיר למה תשחיתנו (רש"י דברים פרק כ פסוק יט)

> *"Is the tree of the field a man?" ... Is the tree of the field perhaps a man that it should be included in the besieged town by you to suffer with hunger and thirst like the people of the city? Why should you destroy it [the tree]?*

Rashi is not necessarily denying that man can be compared to a *tree of the field* in other ways. He seems to be saying that in the context of a wartime siege, a fruit-producing tree should not be treated like a human enemy – that far the comparison does not go. A number of contemporary authors[60] have gone a step further with Rashi's interpretation. They suggest that not only is Rashi avoiding the comparison between humans and trees, but he is also stating – in the words of ethicist David Vogel[61] – that "trees have a life of their own: they don't just exist to serve human needs". This interpretation of Rashi's commentary is immediately contradicted by the fact that Deuteronomy 20:20 allows non fruit-producing trees to be cut down for the purpose of building a siege – despite the fact that it is no less innocent. The only apparent difference between fruit-producing trees and non fruit-producing trees in this context is their utility to man. Therefore, it is unreasonable, in my opinion, to attribute an 'eco-centric' motif to Rashi's commentary. It seems far more reasonable to interpret Rashi as simply using a rhetorical device.

Unlike Rashi, the majority of commentators[62] interpret the verse " כי האדם עץ השדה" not as a rhetorical question but as a statement stressing the relationship or similarity between trees and

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[59] *Peirushei Rashi al haTorah*, ed. Haim Dov Chavel (Jerusalem, 1983), p. 563; *Mechilta of R. Shimon Bar Yochai*, eds. E. Tz. Epstein and Y.N. Melamed (Jerusalem, 1955) and the Aramaic translation of Targum Onkelos on Deuteronomy 20:19, *Torat Chayim* ed. M.L. Katzenellenbogen, Mosad HaRav Kook (Jerusalem, 1994), Dvarim (Deuteronomy), p.174.

[60] For example, Eilon Schwartz, "Bal Tashchit: A Jewish Environmental Precept", in *Trees, Earth and Torah*, (Philadelphia, 1999), pp. 85-87; David Nir, "A Critical Examination of the Jewish Environmental Law of *Bal Taschchit – Do Not Destroy*," *Georgetown International Environmental Law Review*, vol. 18, no. 2, Winter (2006), pp.338-339.

[61] David Vogel, "How Green is Judaism? Exploring Jewish Environmental Ethics," *Business Ethics Quarterly*, vol. 11, no. 2 (2001), pp. 351-352.

[62] This list includes: R. Yosef Bekhor Shor (12th century) *Peirushei al HaTorah*, ed. Yehoshaphat Nevo (Jerusalem, 1994), p. 351; *Torat Chayim* ed. M.L. Katzenellenbogen, Mosad HaRav Kook (Jerusalem, 1994), Devarim (Deuteronomy), pp.173-174: Rashbam , Chizkuni, Ibn Ezra, Nachmanides (Ramban); Rabbeinu Bachya (11th century), *Biur al HaTorah*, ed. Haim Dov Chavel (Jerusalem, 1994), vol. 3, p. 372; R. Menachem Recanati (13th century), *Peirush al haTorah* (Rechovot, 2003), vol.2, p. 68; R. Elazar of Worms (12-13th century), *Peirush Rokeach*

humans. According to these commentators, fruit-producing trees symbolize such concepts as the life support system for man, productive growth and development, and the spiritually-elevated person, as will be discussed below.

2.2.1 Tree as a symbol for the natural world – life support system for man

As noted in the introduction, the natural world is the life support system for man, providing man with all of the resources he needs to survive in this world. The concept of trees representing the natural world is beautifully conveyed in the following *Midrash* from *Kohelet* (Ecclesiastes) *Rabba*[63]**:**

בשעה שברא הקב"ה את אדם הראשון נטלו והחזירו על כל אילני גן עדן ואמר לו ראה מעשי כמה נאים ומשובחין הן וכל מה שבראתי בשבילך בראתי, תן דעתך שלא תקלקל ותחריב את עולמי , שאם קלקלת אין מי שיתקן אחריך (קהלת רבה (וילנא) פרשה ז)

> *When G-d created the first man he took him and showed him all the* trees *of the Garden of Eden and said to him "See my works, how beautiful and praiseworthy they are. And everything that I created, I created it for you. Be careful not to spoil or destroy my world – for if you do, there will be nobody after you to repair it. (emphasis added)*

Note that this *Midrash* singles out *trees*, the trees of the Garden of Eden – rather than the Garden of Eden itself – to represent the natural world, the work of the Creator. Why should trees be chosen to symbolize the natural world?

I suggest that trees are at the pinnacle of the vegetative world. Within the vegetative world, trees reach the greatest height, live the longest, and produce the most benefit over the longest period of time. Jewish tradition frequently uses one element, the pinnacle, to represent an entire spectrum of lesser elements[64].

The vegetative world transforms the earth into an environment capable of supporting other forms of life such as animals and humans. In other words, trees and other vegetation make the planet into a life support system for other forms of life, and ultimately for man. This is also expressed by the Sifrei[65]:

כי האדם עץ השדה, מלמד שחייו של אדם אינם אלא מן האילן (ספרי דברים פיסקא רג)

> *[the phrase] 'because a man is a tree of the field' teaches that the life of man is only from the tree.*

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al HaTorah, ed.Yoel Klugman (Bnei Braq, 1981), vol. 3, p. 227; R. Avraham Sab'a (15th century), *Tzror HaMor HaShalem* (B'nei Braq, 1990), vol. 2, p. 305; R. Yitzchak ben Yehudah HaLevi (17th century), *Pa'aneach Raza* (Warsaw, 1860), p.47; R. Ya'akov ben R. Asher (14th century), Peirush HaTur Ha'arokh al HaTorah (Hanover, 1839), p. 459.

[63] *Ecclesiastes Rabbah* (Vilna, 1878), vol. 2, sect.7:13, p. 39.

[64] This is not unique to the Jewish tradition. For example, *pars pro toto* in Latin syntax describes the same principle. A further example of this concept, which helps illustrate how trees can represent the entire vegetative world is provided in chapter 4 (section 4.3).

[65] *Sifrei*, p.239 (piska 203).

Similarly, R. Avraham Ibn Ezra writes[66]:

כי האדם עץ השדה, והטעם: כי חיי בן אדם הוא עץ השדה (אבן עזרא דברים פרק כ פסוק יט)

> *"Because a man is a tree of the field" and the reason: because the life of a person is [dependent on] trees of the field.*

Both the Sifrei (second century C.E.) and Ibn Ezra – who lived at a later time and may be basing his commentary on the Sifrei – state that human life is dependent on trees. Neither saw it necessary to give further explanation of why this is so; implying that in their time it was an understood fact.

R. Moshe ben Nachman (Nachmanides, 1194-1270) supports Ibn Ezra, and adds an additional point that destroying the enemy's fruit trees would only be harming the victors in the long run[67]:

כי האדם עץ השדה - יפה פירש רבי אברהם כי שיעור הכתוב , כי ממנו תאכל כי האדם עץ השדה ואותו לא תכרות לבא מפניך במצור ... ממנו תאכל ותחיה ... לומר אתה תחיה ממנו אחרי שתכבוש העיר , וגם בהיותך במחנה לבא מפניך במצור תעשה כן (רמב"ן דברים פרק כ פסוק יט)

> *Rabbi Avraham [Ibn Ezra] explains well "because you will eat from it, because a man is a tree of the field", and "don't cut it down" "to make a siege"... from it [the tree] you will eat and live ... and you will live from it after you conquer the city, as well as when you are in the war-camp, to make a siege against the city you will do so [live from the tree].*

Likewise, the 11th century Italian commentator, R. Bachya ben Asher, also known as *Rabbeinu Bachya* writes[68]:

פירשו המפרשים ז"ל כי חיי האדם ומזונו הוא עץ השדה , וכענין שכתוב (דברים כד) כי נפש הוא חובל, ועל כן אנכי מצוך שלא תשחיתהו כי ברכה בו. ולפי דעתי כי האדם נמשך אל לא תכרות ובאור הכתוב כי לא האדם עץ השדה שיבא מפניך במצור כמו האדם, ואין מפעולות עם חכם ונבון להשחית הדבר הראוי ללא תועלת, ולכך אין לך להוציא כח בזה לכרות עץ השדה אלא שתשמור מהשחית אותו ומהזיקו ותקח ממנו התועלת , זהו כי ממנו תאכל, ואם אתה משחיתו נמצאת מזיק ומפסיד התועלת (רבינו בחיי, דברים כ:י"ט)

> *The commentators explain that the life of man and his food is [from] a tree of the field…and it is not the way of a wise and understanding nation to destroy something so worthy, without any purpose, and therefore you shouldn't cut down a tree of the field, rather you should protect it from destruction and damage, and take benefit from it – this is [the meaning of] "you should eat from it". If you destroy it, the benefit will be damaged and lessened.*

It is unclear in the above commentaries just what is meant by 'man's life depends on trees'. The first two commentaries (Sifrei and Ibn Ezra) might suggest that this is describing the fact that trees provide food for man – although it would seem that tree fruits are rarely a significant part of man's nutrition. The last commentary, from Rabbeinu Bachya, suggests that there is something very

[66] *Torat Chayim*, Deut: Ibn Ezra, pp.174 (Deut. 20:19). Ibn Ezra is apparently quoting from an earlier source, the Sifrei, listed above.
[67] Nachmanides, vol. 2, pp. 438-439 (Deut. 20:19).
[68] R. Bachya, vol. 3, p.372 (Deut. 20:19).

important that these trees provide in addition to food (*the life of man* and *his food is [from] a tree of the field*). In light of current knowledge, trees and other photosynthesizers also produce oxygen[69] – which is vital for man's existence in this world. Nevertheless, it seems unlikely that that is what Rebbeinu Bachya is referring to. The scientific discovery of photosynthesis and the importance of the oxygen produced in the process as a necessary part of life support for man didn't come about until much later. The Dutch physician Jan IngenHousz is credited with discovering photosynthesis and its role in the production of oxygen in 1796, centuries after the lives of these commentators.

R. Yaakov Kuli (1689-1732), one of the authors of an 18th century encyclopedic commentary on the *Tanach,* called "*Me'Am Loez*" writes[70]:

וחייו של אדם אינם אלא מן האילן, והאילן חשוב כל כך לקיום העולם עד שחכמים תיקנו ברכה מיוחדת ליוצא בימי ניסן ורואה אילנות מלבלבים , שמברך ברוך שלא חיסר בעולמו וברא בו בריות טובות ואילנות טובות [להינות מהם בני אדם[71]].

> *Man's life is dependent on trees, and the tree is so important for the existence of the world that the sages established a special blessing to those who go out in the days of [the Hebrew month of] Nisan and see blossoming trees. They bless: Blessed [is He] that nothing is lacking from His world and He created good creations and good trees [for the benefit of man]"*

Kuli writes of the importance of trees to the existence of the world, and to the benefit of man. It is important to note that in the Jewish liturgy there is no comparable blessing – which is uniquely singled out for one of the natural wonders of the creation that provides continuous benefit to man[72]. This despite the fact that there are other important aspects of the natural world, which might be considered at least as important to man, such as the rainfall or the harvesting of crops. This blessing is said only on the blossoms of fruit-producing trees[73].

In situations of major transition, such as the creation of the world and the arrival of the people of Israel in the land of Israel, the Jewish sources stressed the importance of first preparing the necessary life-support system, expressed again as trees[74]:

אחרי ה' אלקיכם תלכו, וכי אפשר לבשר ודם להלוך אחר הקב "ה ...אלא מתחלת ברייתו של עולם לא נתעסק הקב "ה אלא במטע תחלה הה "ד (בראשית ב) ויטע ה' אלקים גן בעדן, אף אתם כשנכנסין לארץ לא תתעסקו אלא במטע תחלה (ויקרא רבה (וילנא) פרשה כה)

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[69] While trees produce oxygen during the process of photosynthesis, they also consume oxygen when not performing photosynthesis, and oxygen is consumed when parts of the tree are decomposed or combusted. Therefore, there is some question as to whether forests actually produce more oxygen than they consume (see for example *Science*, July 12, 2006).

[70] R. Yaakov Kuli, *Yalkut Me'am Loez*, ed. and trans. Shmuel Yerushalmi (Jerusalem, 1970), p. 775.

[71] The prevailing custom is to end the blessing with these words 'for the benefit of man' (see for example B.T. Brachot 43b, Rosh Hashana 11a where these words are included).

[72] Blessings are sometimes made on other natural occurrences such as the new rainfall (see B.T. Brachot 59b), but these are more general blessings on something giving benefit to man and not particular to the natural occurrence.

[73] Shulchan Arukh (Standard Format edition) (Jerusalem, 2005), Orach Chayim, vol. 1, 226:1, p. 309.

[74] *Leviticus Rabbah* (Vilna, 1878), vol. 2, sect. 25:3, p. 70.

> *[It is said] "follow the Lord, your God." And is it possible for flesh and blood to go after God?… rather, from the beginning of the creation of the world, His first involvement was to plant trees, as it written, (Genesis 2) "and God planted a garden [of trees] in Eden." So you, too, when you will enter the land, planting trees should be your first involvement*[75].

While trees provided part of the diet and were important to the economy of the Middle East in ancient times, it is once again remarkable to find trees given this level of importance. It would appear that the importance the Jewish sources ascribe to trees exceeds their obvious role to man in providing nutrition, oil, wood for fuel and construction material, and certain medicinal products. Indeed, numerous cultures around the world have been able to survive in environments devoid of trees[76].

Parenthetically, it might be suggested that – as a symbol of the life-support system for man - trees also play an important educational role in the Jewish sources. Originally, the sources tell us, trees were meant to be entirely edible, with the trunk and branches tasting like the fruit[77]. Since trees were originally meant to be the main source of food for man[78], the entire tree could be consumed for immediate benefit. Consuming the entire tree, however, would destroy the productive capacity of the tree. Alternatively, the tree could be left intact to produce edible fruits which could be continuously consumed without destroying the tree itself. The foregoing teaches the need to forego the destructive exploitation of natural resources for immediate, short-term benefit, in favor of preserving the productive capacity of resources – to allow the sustained utilization of their 'fruits'. This important ecological principle, known today as *sustainability* or *sustainable use*, is illustrated in the following Talmudic story[79] – also taught in the context of a fruit-producing tree:

יומא חד הוה אזל באורחא , חזייה לההוא גברא דהוה נטע חרובא , אמר ליה: האי, עד כמה שנין טעין ? - אמר ליה: עד שבעין שנין. - אמר ליה: פשיטא לך דחיית שבעין שנין ? - אמר ליה: האי [גברא] עלמא בחרובא אשכחתיה , כי היכי דשתלי לי אבהתי - שתלי נמי לבראי. (תלמוד בבלי מסכת תענית דף כג עמוד א)

> *One day as he [Honi] was walking along he saw a man planting a carob tree. He [Honi] asked him "how many years will it take until it will bear fruit?" The man replied "not for seventy years". He [Honi] asked him, "do you really believe you'll live another seventy years?" The man answered, "I found this world provided with carob trees, and as my ancestors planted them for me, so I too plant them for my descendants."*

In a similar vein is the following midrash:[80]

כשם שנכנסתם ומצאתם נטיעות שנטעו אחרים, אף אתם נטעו לבניכם (מדרש תנחומה, פרשת קדושים).

> *Just as you came and found trees planted by others, you must plant for your children*

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[75] It is interesting to note that the Jewish National Fund (JNF) expended great effort to plant trees in the land of Israel, especially during the early years of statehood. Over the past century, the JNF has planted over 200 million trees on more than 900,000 dunams (225,000 acres; 90,000 ha) of land (based on their website at: http://www.kkl.org.il/kkl/english/main _subject/forest and _places/fgeneral/kkl%20afforestation%20work.htm)

[76] For example, in desert and arctic regions trees can be extremely rare if not totally absent, and yet humans have been known to survive in these regions for thousands of years.

[77] See for example *Peirushei Rashi al haTorah*, ed. Haim Dov Chavel (Jerusalem, 1983), p.5 (on Gen. 1:11), which is based on *Genesis Rabbah* 5:9, vol. 1, p. 35.

[78] Genesis 1:29

[79] B.T. Ta'anit 23a.

[80] *Midrash Tanchuma*, ed. Shlomo Buber (Jerusalem, 1964), vol. 2, Kedoshim 8, p. 76.

The above sources demonstrate the vital importance the Jewish sources place on trees as a symbol of the life-support system for man, and in the management of the long-term viability of the life support system by planting and protecting trees. The action of planting trees is one of the most tangible ways that man can positively affect his natural environment, as will be further discussed in chapter five (section 5.2.3.5).

2.2.2 Tree as a symbol for productive growth and development

Aside from symbolizing the natural world as the life-support system for man, trees also symbolize productive growth and development in this world. Trees are unique in the natural world in that they can live for centuries and continue to grow as long as they live – as evidenced by the new ring of growth that appears in the trunk of a tree each year. R. Hirsch writes[81]:

> *Trees, [and] wood in general, is the picture of progressive growth and development*

Similarly, Hirsch writes elsewhere[82]:

> *The tree is the one species among all organic creations that develops before our eyes from the smallest of beginnings, takes the longest to complete its process of maturation, proliferates and expands the most in its development, and at the same time becomes taller and reaches a greater age than any other living being. The tree is consequently the most natural metaphor for any long-continued, steady process of maturation [progress]. It symbolizes hope that will find its realization over a long period of time and through dedicated effort.*

This symbolism of trees as representing long-lasting growth is also expressed in the words of the prophet Isaiah[83]:

כִּי כִימֵי הָעֵץ יְמֵי עַמִּי (ישעיהו פרק סה פסוק כב)

> *For as the days of a tree shall be the days of my people*

If the only intent in this comparison was for expressing the long duration of "my people", it would have made more sense to compare the *days of my people* with a mountain or other inanimate object that can endure far longer than trees. Trees – in distinction to long-lasting inanimate objects – are alive and continue to grow and produce despite their advancing age.

A tree also symbolizes the integration of two conflicting forces that are required by man to grow and develop[84] in this world. First, the vertical growth of the trunk and branches symbolizes the need to "reach for the sky". Second, the roots symbolize the need for being securely grounded. The higher the tree grows, the deeper and more securely it must anchor its roots in the ground.

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[81] R. Hirsch, Pentateuch, vol. 2, p.431.
[82] R. Hirsch, *Jewish Symbolism*, The Collected Writings, vol. lll; 3rd edition, (Jerusalem, 1995), pp. 182-184
[83] Isiah 65:22
[84] It is interesting to note that the field of psychology also apparently recognizes a special relationship between human development and trees. One of the diagnostic tools for testing psychological development is the "H-T-P" test - in which the subject is asked to draw a picture of a 'tree' (along with a picture of a 'house' and a 'person').

Likewise, one could say, all human endeavors require idealism integrated with a solid base of support.

2.2.3 Fruit-producing tree as a symbol for a human and in particular for a spiritually elevated person

Along with representing positive growth and development, a fruit tree is frequently used in Jewish tradition as a symbol for a human being. For example, R. Eliezer Waldman (1915-2006) writes that in many places in the writings of the Sages we find that man is compared [metaphorically] to a tree of the field[85]. The symbolic connection between man and fruit-producing trees is particularly strong for individuals with certain elevated traits, which will be described below and will be further developed in the fourth chapter of this thesis.

One of the ways in which man is compared to trees in the Jewish sources is the role both play in connecting the heaven with the earth, or the upper world with the lower world. For example, sixteenth century mystic, R. Yehuda Loewe of Prague, known as the 'Maharal' writes[86]:

כי באמת האדם נקרא עץ השדה דכתיב "כי האדם עץ השדה", רק שהוא אילן הפוך כי העץ שורשו למטה תקוע בארץ , ואלו האדם שורשו למעלה כי הנשמה הוא שורש שלו והוא מן השמים. והידים הם ענפי האילן , הרגלים הם ענפים על ענפים, גופו הוא עיקר האילן . ולמה הוא אילן הפוך ? כי העץ שורשו למטה כי העץ חיותו מן האדמה , והאדם חיותו נשמתו מן השמים.

> *For in truth, a man is called a tree of the field, as it is written, "because man is a tree of the field". It's just that he is an upside down tree, for the tree has its roots stuck below in the land, whereas man has his roots above -- for the soul, which is his root, is from heaven. And the hands are the branches of the tree, the feet are the branches off the branches, his torso is the trunk of the tree. And why is he an upside-down tree? Because the tree's roots are below for the tree's life source is from the earth, while the life source of a person's soul is from heaven.*

18th century Hassidic author R. Shmuel Bornstein, in his commentary on the Pentateuch, similarly understands the comparison of trees to man as expressing how both form a connection between the upper and lower worlds[87]. Just as a tree serves as the link between the earth and the fruits, so too man is the link between heaven and the fruits that he produces, which are his mitzvot (good deeds)[88].

Fruit trees in particular represent a spiritually elevated, growing and productive person who benefits others and benefits the world. In the Jewish tradition, the *Talmid Chacham* (Torah scholar) and the *Tzaddik* (righteous person) both represent the pinnacle of this ideal. These are individuals who have undergone extensive spiritual growth and development and who bring great benefit (fruits) to the world. The Talmud teaches[89]:

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[85] R. EliezerYehudah Waldenberg, Sha'alot u'Teshuvot Tzitz Eliezer (Jerusalem, 1985), vol. 5, sect. 11, p. 242 – the concluding discourse on tractate Ketubot.
[86] R. Yehudah Loewe of Prague (Maharal), *Sefer Netzach Yisrael* (Bnei Braq, 1980), ch. 7, p. 47.
[87] R. Shmuel Bornstein, *Shem M'Shmuel* (Jerusalem, 1987), Exodus A, pp. 194-196.
[88] This interpretation will play an important role in Chapter 4, where both man and trees are viewed as connectors between the earth's ecosystem and something outside the system. From this connection they are able to produce tangible benefit for those living in the earth's ecosystem.
[89] B.T. Brachot 64a, Yevamot 122b, Nazir 66b, Tamid 32b, Kritut 28b.

אמר רבי אלעזר אמר רבי חנינא: תלמידי חכמים מרבים שלום בעולם (תלמיד בבלי ברכות ס"ד.)

> *Rabbi Eliezer said in the name of Rabbi Chanina, Torah scholars increase shalom in the world.*

Shalom, in Hebrew, can mean peace, as well as completion, harmony and well-being – each of which contribute to the welfare of the world and its inhabitants. The Talmud compares a Torah scholar to a tree in the following verse[90]:

אמר רבי יוחנן : מאי דכתיב כי האדם עץ השדה , וכי אדם עץ שדה הוא ? אלא משום דכתיב כי ממנו תאכל ואתו לא תכרת, וכתיב אתו תשחית וכרת. הא כיצד? אם תלמיד חכם הגון הוא - ממנו תאכל ואתו לא תכרת (תלמוד בבלי מסכת תענית ז.)

> *Rabbi Yochanan said "Why does it say 'because man is a tree of the field'? And is a man really a tree of the field? But rather, because it says, 'for you may eat of it, and you shall not cut it down'... What does this mean? If he is a proper Torah scholar then eat from him and don't cut him off [learn from him and don't depart from his ways].*

Just as a fruit-producing tree brings benefit to the world, so too, in the Jewish tradition, a Torah scholar brings benefit to the world. R. Shmuel Edels (1555-1631) explicitly compares both a Talmud Chacham and a Tzaddik to a fruit-producing tree in the following commentary[91]:

וכמו שמפרשים לקמן בפרקין שאיש כשר ות למיד חכם דומה לעץ מאכל שנאמר בו ואותו לא תכרות ... ולזה לפי גרסת כל הספרים גמרות שלנו דימה הכא את הת למיד חכם והצדיק בג' מעלות טובות בתורה בעושר ובבנים לאילן (מהרש"א חידושי אגדות מסכת תענית דף ה עמוד ב)

> *As we explain later in the chapter, an upright person and a Torah Scholar are similar to a fruit-producing tree… According to all of the versions of the Talmud that we have, the Torah Scholar and Tzaddik are similar in three good ways to a tree – in Torah, in wealth and in offspring…*

The understanding here, in my opinion, is that just as a fruit-producing tree produces benefit for the world, so too a Torah Scholar and a Tzaddik produce benefit for the world through the Torah, wealth and offspring that they produce, which improve the lives of others.

R. Hirsch explicitly compares a righteous person to a fruit-producing tree in the following commentary[92]:

> *The tree becomes an apt metaphor for the righteous man, who is firmly grounded in G-d and His Torah, from which he derives his development and prosperity. G-d and His Torah represent the well springs of living waters and man is the tree that draws from them his strength, his substance, his life and his good fortune, without which he would wither and die.*

Just as a fruit tree endures - drawing from both the otherwise unutilized wavelengths of photo-energy from the sun and from the hidden soil to bring benefit to the entire world – so too the

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[90] B.T. Ta'anit 7a.
[91] B.T. Ta'anit 5b: commentary of R. Shmuel Eliezer Edels (Maharsha) (aggadic section, p.2, col. 2).
[92] R. Hirsch, *Jewish Symbolism*, The Collected Writings, Vol. lll, 3rd ed. (Jerusalem, 1995) pp. 182-184.

righteous person transforms the underutilized potential of this world into benefit for all of creation. In the words of the prophet Jeremiah[93]:

בָּרוּךְ הַגֶּבֶר אֲשֶׁר יִבְטַח בַּיי וְהָיָה יְקוָק מִבְטַחו וְהָיָה כְּעֵץ שָׁתוּל עַל מַיִם וְעַל יובַל יְשַׁלַּח שָׁרָשׁ יו וְלֹא יִרְאֶה כִּי יָבֹא חם וְהָיָה עָלֵהוּ רַעֲנָן וּבִשְׁנַת בַּצֹּרֶת לֹא יִדְאָג וְלֹא יָמִישׁ מֵעֲשׂוֹת פֶּרִי (ירמיהו פרק יז פסוק ז – ח)

Blessed is he who trusts in the Lord, whose trust is the Lord alone. He shall be like a tree planted by waters, sending forth its roots by a stream: It does not fear the coming of heat, its leaves are ever fresh; it has no care in a year of drought, it does not cease to yield fruit.

One of the ways that trees differ from lower forms of plant life is that trees continue to grow and produce fruits over an extended period of time. Lower forms of plant life[94], upon reaching maturity (usually within a year), channel their resources into reproduction, produce their fruit and then die. Trees, on the other hand, can usually produce fruits on a continual basis (at least once per year). This continuous production of fruits doesn't seem to affect the lifespan or wellbeing of the tree. On a metaphorical level, a righteous person realizes that his constant giving to others does not take away from him – it only adds to him and his world. Like a fruit tree, a righteous person's acts of giving – which are the 'fruits' he produces – benefit both himself and others.

In contrast to the righteous person, the wicked are often symbolized in the Jewish sources by weeds and thorns. Instead of producing fruits for the benefit of the rest of creation, weeds and thorns produce hardship and suffering for others. There are numerous references to this contrast between the righteous, as symbolized by trees, and the wicked, symbolized by weeds and thorns, in the Psalms, as the following examples illustrate:

בִּפְרֹחַ רְשָׁעִים כְּמוֹ עֵשֶׂב ויציצו כָּל פעלי אָוֶן, לְהִשָּׁמְדָם עֲדֵי עַד: ... צַדִּיק כַּתָּמָר יִפְרָח כְּאֶרֶז בַּלְּבָנוֹן יִשְׂגֶּה: שְׁתוּלִים בְּבֵית יְקוָק בְּחַצְרוֹת אֱלֹהֵינוּ יַפְרִיחוּ: עוֹד יְנוּבוּן בְּשֵׂיבָה דְּשֵׁנִים וְרַעֲנַנִּים יִהְיוּ. (תהילים צ"ב:ז, י"ג-ט"ז)

When the wicked spring like weeds, and when all the workers of iniquity flourish, it is so they will be forever destroyed. …The righteous man flourishes like the palm tree, he grows like a cedar in Lebanon…they shall still bring forth fruit in old age[95].

וְהָיָה כְּעֵץ שָׁתוּל עַל פַּלְגֵי מָיִם אֲשֶׁר פִּרְיוֹ יִתֵּן בְּעִתּוֹ וְעָלֵהוּ לֹא יִבּוֹל וְכל אֲשֶׁר יַעֲשֶׂה יַצְלִיחַ (תהילים א:ג)

They [the righteous] will be like a tree planted by a pool of water, that will give their fruit in the right time, and their leaves won't wilt, and all that they do will succeed; not so the wicked, they are like thorns that the wind will scatter[96].

The contrast between the righteous and wicked people is expressed in what might be considered ecological terms by the fourteenth century author of *Sefer HaChinuch.* In his explanation of the prohibition of *bal tashchit* - which is taught through the example of the fruit-producing tree of Deuteronomy 20:19 - he writes[97]:

[93] Jeremiah 17:7-8.
[94] Note: perennial plants, even if they don't grow vertically – such as grape vines and shrubs are considered 'trees' in the Jewish sources (see B.T. Brachot 40a, Shulchan Aruch siman 207).
[95] Psalms 92:7, 13-15.
[96] Psalms 1:3.
[97] R. Aharon HaLevi of Barcelona (?), *Sefer HaChinukh* (Jerusalem: Yesodi, 1990), vol. 2, commandment 529, p. 420.

וזהו דרך החסידים ואנשי מעשה אוהבים שלום ושמחים בטוב הבריות ומקרבים אותן לתורה, ולא יאבדו אפילו גרגר של חרדל בעולם, ויצר עליהם בכל אבדון והשחתה שיראו , ואם יוכלו להציל יצילו כל דבר מהשחית בכל כחם , ולא כן הרשעים אחיהם של מזיקין שמחים בהשחתת עולם והמה משחיתים (ספר החינוך מצוה תקכט).

> *This is the way of the pious and elevated people; they love peace and rejoice in the good for other people, and to bring them near to God's way. They will not [needlessly] destroy even a mustard seed, and they are distressed at every ruination and spoilage they see. If they are able to save, they will save anything from destruction with all of their power. Not so, however, are the wicked, the brethren of destructive forces that rejoice at the destruction of the world, until they themselves become destroyed…*

The Sefer HaChinuch clearly links pious and elevated behavior with what might today be called "eco-friendly" or at least 'environmentally-responsible'. The 'wicked' he describes as acting in a way that is very destructive to the world.

2.3 Summary

As discussed above, trees – and particularly fruit trees – appear in Jewish sources throughout the ages as symbols for three distinct concepts in the Jewish sources:

A. The life support system for man
B. Productive growth and development
C. The spiritually elevated person (the Talmid Chacham or Tzaddik)

Relative to man, these concepts form a progression – from basic survival, as provided by the life support system, to progressive growth and development – including non-physical development such as spiritual and intellectual growth – to reaching the pinnacle of life – being a source of benefit to others and for the entire world. In the Jewish sources, man is considered to be the focus of the physical creation[98] and the *Tzaddik* and the *Talmid Chacham* represent not only the pinnacle of humanity but also the ones whose actions sustain the world[99].

Further summary of the analysis of Deuteronomy 20:19-20 presented above will be presented at the end of chapter 4 – after the introduction of several additional concepts necessary to make the summary more complete.

2.4 Connection of trees with the prohibition against needless destruction – *bal tashchit*

It is very significant, in my opinion, that the Biblical prohibition of *bal tashchit* is taught with the example of fruit-producing trees, which symbolize the life support system – the natural resources and natural processes that provide for man's existence in this world. Therefore, the prohibition against the destruction of fruit-producing trees can be, and indeed has been interpreted in the Jewish tradition to include all resources – all useful materials and objects that are beneficial to man's existence. According to R. Moshe ben Maimon (1135-1204), also known as Maimonides:

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[98] This point will be discussed in more detail in the next chapter (section 3.2.2.4).

[99] Indeed, in the Jewish sources the *Tzaddik* or righteous person is considered the 'foundation of the world', because the world is maintained by virtue of his righteous acts. This is expressed in the verse צדיק יסוד העולם ([The] Tzaddik [is the] foundation of the world) in Proverbs 10:28. See also chapter 4 (section 4.2.3 – description of R. Chanina).

ולא האילנות בלבד, אלא כל המשבר כלים, וקורע בגדים, והורס בנין, וסותם מעין, ומאבד מאכלות דרך השחתה, עובר בלא תשחית (רמב"ם הלכות מלכים פרק ו)

> *Not only one who cuts down trees, but also one who breaks household goods, tears clothes, demolishes buildings, stops up a spring, or destroys articles of food, in a destructive way, violates the command of bal tashchit*[100].

Maimonides' phrasing of *in a destructive way* (דרך השחתה) is an important qualifier. As the next chapter will illustrate, not all destruction is prohibited. The destruction prohibited by *bal tashchit* is variously described as *needless*[101], *senseless*[102], *purposeless*[103], or *wanton*[104] destruction, where the costs exceed the benefits and there is a net loss to the welfare of man. I consider the term *needless* to be the most suitable of these qualifying terms and will use it throughout the thesis.

The following chapter will present a detailed description and analysis of the prohibition of *bal tashchit* and its application to both fruit trees and other resources.

[100] Maimonides, *Mishneh Torah*, ed. S. Frankel (Jerusalem and B'nei Braq, 1998), Laws of Kings 6:10, vol. 12, pp. 263-264.
[101] See for example, Vogel (2001), p.359, in his translation of Maimonides.
[102] See for example: Aryeh Carmell, *Masterplan, Judaism: its program, meaning, goals*, (Jerusalem, 1991), p.50
[103] Hirsch, *Pentateuch*, vol. 5, p.395.
[104] See for example: Gerstenfeld (1998), p.112.

Chapter 3. A description of the prohibition of *bal tashchit*

Bal tashchit [don't needlessly destroy] is the Biblically-derived prohibition against wasting or needlessly destroying resources. As such, *bal tashchit* has mandated resource conservation for religiously-observant Jews for thousands of years.

This chapter is divided into three sections:

3.1 Chronological overview of *bal tashchit* in Jewish tradition

3.2 Legal parameters for the application of *bal tashchit*

3.3 Principles underlying *bal tashchit*

3.1 Chronological overview of *bal tashchit* in Jewish Tradition

To better understand the prohibition of *bal tashchit*, I will trace it back to its origins in Jewish tradition and examine how it has been described and applied up to the present day. While the basic prohibition is rooted in the Hebrew Bible, the emphasis on how to apply the prohibition may have been influenced by the changing conditions of Jewish life, both in the land of Israel and in the diaspora. These changes may help shape our current understanding of the prohibition of *bal tashchit*.

This overview will examine the prohibition of *bal tashchit* over time, from the perspective of Jewish tradition. As I stated in the final page of the introduction, I am not approaching this overview as an academic or a historian. In arranging the Jewish texts in a chronological order, my purpose is two-fold. First, I want to provide a systematic framework for compiling and examining the textual sources for *bal tashchit*. Assembling them in chronological order, from the earliest texts to the most recent, provides such a framework. Secondly, I want to present the lay reader with some context in which to enter the classical world of Jewish texts and to view these texts through the lens of Jewish tradition.

Jewish tradition groups the classic Jewish texts into several divisions according to different chronological eras of Jewish jurisprudence, which is usually based on a recognized uniformity and equality in the authority of the legal writings composed, and on the status of their proponents and transmitters in any given era. I will utilize the following traditional grouping, along with its generally accepted time delineations[105]:

1. *Tanach* - up to 160 B.C.E.
2. *Talmudic Period* – up to the end of the 5th century C.E.
3. *Savoraim-Gaonim* - end of 5th century to mid 11th century.
4. *Rishonim* – 11th -16th centuries.

[105] For the purposes of this thesis, exact dates are not important, nor is the fact that some of the dates used in Jewish tradition may differ from more academically-oriented dates.

5. *Acharonim to Modern era* - 16 century onwards.

In the following sections (3.1.1 - 3.1.5) I will provide a brief introduction to each era before examining texts from that era. The texts examined are selected for their novelty, with each selected text presenting a different aspect of *bal tashchit* that was emphasized or further developed within that era. From these texts I will develop a legal framework of *bal tashchit*, in Section 3.2, followed by a more detailed development of this framework, in which I will include additional texts.

3.1.1 Tanach – up to 160 B.C.E.

The prohibition of *bal tashchit* first appears in the written Torah or Pentateuch. The Torah describes a process from the time of creation until the entry of the Jewish people into the land of Canaan. The five books of the Torah, along with nineteen other books of prophecy, history and ethics – together, compose what is called in Hebrew the "Tanach[106]". Some of the early commentary on the Torah was collected into different books of *Midrash*, or *exegesis*, which are also central to the Jewish world-view, and many of which appear in the Talmud.

The legal prohibition of *bal tashchit* is introduced in the fifth and final book of the Torah, known as the book of Deuteronomy. Concepts related to *bal tashchit*, such as the protection of the world's resources, appear in the Torah prior to the book of Deuteronomy. The following are two examples:

Corruption [hashchata] of the world preceding the tradition of the great flood.

According to the Torah, this world was created and began in the state of 'very good':[107]

וַיַּ֣רְא אֱלֹקִ֔ים אֶת כָּל אֲשֶׁ֥ר עָשָׂ֖ה וְהִנֵּ֣ה טוֹב מְאֹ֑ד (בראשית פרק א)

> *And The Creator saw all that He had done and behold, it was very good*

Despite the good beginning, mankind, through disobeying the will of the Creator, progressively corrupted the world and its inhabitants[108].

וַתִּשָּׁחֵ֥ת הָאָ֖רֶץ לִפְנֵ֣י הָאֱלֹקִ֑ים וַתִּמָּלֵ֥א הָאָ֖רֶץ חָמָֽס׃ וַיַּ֣רְא אֱלֹקִ֔ים אֶת הָאָ֖רֶץ וְהִנֵּ֣ה *נִשְׁחָתָ֑ה* כִּ֣י *הִשְׁחִ֔ית* כָּל בָּשָׂ֖ר אֶת דַּרְכּ֥וֹ עַל הָאָֽרֶץ׃ (בראשית פרק ו)

> *[As a result of man's incorrect actions] the earth also was* corrupt *before The Creator, and the earth was filled with violence. And The Creator looked upon the earth, and, behold, it was* corrupt*; for all flesh had* corrupted *its way upon the earth* (emphasis added)

[106]Tanach is an acronym for Torah (Instructions), Nevi'im (Prophets) and Ketuvim (Writings) which are canonized in the Hebrew Bible, usually referred to as the 'Old Testament' in non-Jewish traditions.
[107] Genesis 1:31.
[108]Genesis 6:11-12.

This corruption culminated in a global flood that destroyed all terrestial life except that which was saved inside of Noah's ark[109]. The Hebrew word used to describe the destruction-causing corruption by mankind is *shachat* (שחת). In Hebrew etymology, *shachat* is also the root of the second word in the expression *bal tashchit* (בל תשחית).

In his exposition of the meaning of the Biblical Hebrew roots on Gen. 6:11, R. Hirsch writes[110]:

> שחת *[shachat] is the conception of corruption, not destruction*[111]. *It is the overthrow of a good condition, and the impeding of progress, and the changing into the opposite of anything which was meant to thrive and prosper.*

As introduced in section 2.1.2, R. Hirsch's words imply that this world was meant to thrive and prosper. Man's improper actions can negatively interfere with, and cause the corruption and degradation of the world, as evidenced by the Biblical flood. From this perspective, the prohibition of *bal tashchit* can be seen as a measure to prevent the corruption and degradation of the earth's resources.

The Biblical patriarch Jacob demonstrates the importance of conserving resources and preventing their (passive) destruction or waste

Jewish tradition describes how the Biblical patriarch Jacob risked his life in order to retrieve small and seemingly insignificant containers he had left behind on his way back to the land of Israel[112].

וַיִּוָּתֵר יַעֲקֹב לְבַדּוֹ (בראשית פרק לב פסוק כה)

> *And Jacob was left alone…*

According to the Rabbinic interpretation of this verse – as described in the Talmud[113], and later cited by 'Rashi[114]'in his commentary on Gen. 32:25:

ויותר יעקב - שכח פכים קטנים וחזר עליהם (רש"י בראשית פרק לב פסוק כה)

> *He [Jacob] went back to retrieve small containers he had forgotten [when crossing the river to enter the land of Israel]*.

This act demonstrates that conserving resources was an important principle to Jacob, even though at the time of this event, he is described as being very wealthy, with many servants as well as flocks of camels, sheep, goats and cattle[115]. In his commentary on this event, R. Hirsch writes[116]:

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[109] Genesis 6:9- 7:1 describes how the Biblical figure Noah built an ark in which he, his family and a mating pair of each living species (and 7 pairs of ritually pure species) were able to survive the great flood.

[110] R. Samson Raphael Hirsch, *The Pentateuch, translated and explained*, trans. Isaac Levy (Gateshead, 1982), vol. 1, p.138. Much of Hirsh's commentary is based on his etymological analysis of the Hebrew words in each verse.

[111] According to the law of conservation of matter and energy, neither matter nor energy can be created or destroyed. Therefore, it is reasonable to say that *hashchata* doesn't really mean to destroy, but rather, to corrupt (in line with Hirsch's commentary on this page) or degrade – transforming the matter to a less useful form which can no longer achieve its original purpose. This concept will be further developed in Chapter 4.

[112] Genesis 32:25 (see B.T. Chullin 91a). Many commentators see this as an antecedent to the prohibition of bal tashchit. In fact a recently published book on the prohibition of bal tashchit was titled after this incident (*Al pachim ketanim* [on small containers] by R. Siman Tov ben Dovid Dovid, (Tel Aviv, 2001).

[113] B.T. Chulin 91a.

[114] *Peirushei Rashi al haTorah*, ed. Haim Dov Chavel (Jerusalem, 1983), p.121.

The righteous ones see even in the smallest value of honestly acquired fortune, something holy, which they may neither squander nor allow to be uselessly wasted, and for the rightful use of which they will be called to account. A million has, for them, only the value of a pin, if it is a question of spending it for God-pleasing purposes, and a pin has the value of a million if it is a question of wasting it uselessly…

Biblical Prohibition of *bal tashchit*

The Biblical prohibition of *bal tashchit* appears in Deuteronomy 20:19-20:

כי תצור אל עיר ימים רבים להלחם עליו לתפשה, לא תשחית את עצה לנדח עליו גרזן, כי ממנו תאכל ואתו לא תכרות, כי האדם עץ השדה לבא מפניך במצור . רק עץ אשר תדע כי לא עץ מאכל הוא אותו תשחית וכרתה ובניתה מצור על העיר אשר היא עשה מלחמה עד רדתה. (דברים כ׳:יט-כ)

When thou shalt besiege a city a long time, in making war against it to take it, thou shalt not destroy its trees by forcing an axe against them: for thou mayst eat of them, and thou shalt not cut them down -- for man is a tree of the field – to bring [the city] before thee in a siege. Only the trees which thou knowst that they be not trees for food, thou shalt destroy and cut them down; and thou shalt build bulwarks against the city that makes war with thee, until it be subdued.

This verse introduces the prohibition of *bal tashchit* in the seemingly narrow context of preserving fruit-producing trees during a wartime siege. While there are antecedents to the concept of conservation of other resources, as described above, there seems to be no direct indication in these verses, or elsewhere in Tanach that *bal tashchit* applies to other objects or in other situations. Therefore, a literal reading of the Tanach would seem to leave us with a very limited understanding of the prohibition of *bal tashchit* and little clue that it would apply to the conservation of all resources[117].

It is important to stress (as was noted in the end of the first chapter) that in traditional Judaism, the text of the Tanach is never studied without the accompaniment of the commentaries and the oral tradition upon which these commentaries are usually based. The following sections illustrate the importance of the accompaniment of the commentaries and oral tradition in the formulation of *bal tashchit*..

[115] Genesis 32.15-17.
[116] R. Hirsch commentary on Genesis 32:25.
[117] I alluded to this point in footnote 10 in the first chapter, regarding the omission of *bal tashchit* in the works of some non-Jewish academicians, in their analyses of the ecological teachings of the Tanach.

3.1.2 Talmudic era (up to end of fifth century)

According to Jewish tradition, the Talmud is the record of oral commentary ('oral law') on the Torah ('written law') both of which were received on Mount Sinai.

The codification of the oral law was accomplished in two stages. The *Mishnah*, a terse collection of legal rulings about matters ranging from civil torts and marriage laws to agricultural laws was compiled in approximately 200 C.E. Centuries later, extensive commentaries on the Mishnah, known as the *Gemara*, were compiled in Babylon and Jerusalem. Together, the Mishnah and the Gemara compose what is today known as the Talmud. According to Jewish tradition, the Babylonian Talmud, the more authoritative of the two Talmudic works, was redacted in approximately 500 C.E., and the Jerusalem Talmud[118] was redacted in the land of Israel in approximately 350 C.E.

Scope of Coverage in Talmudic sources

As a commentary on the written law, the Talmudic sources describe the prohibition of *bal tashchit* in a scope greatly expanded from a literal reading of the Biblical verses cited in Deuteronomy 20:19-20. It is this expanded scope which forms much of the basis for the traditional Jewish view on *bal tashchit*, and on the conservation of resources. It is interesting to note that there are no direct references to the prohibition of *bal tashchit* in the Mishna. There are 12 references in the Babylonian Talmud and none in the Jerusalem Talmud. One possible explanation, which will be built upon in section 3.1.6, is that the situation of the Jewish population in Babylonia during the later Talmudic period was often more secure and prosperous than that of the Jewish population in the land of Israel. The emphasis on *bal tashchit* may increase with increasing material wealth and security. The expanded scope of coverage of *bal tashchit* described in the Talmud (and more precisely, in the Gemara of the Babylonian Talmud) includes:

Inanimate objects, for example - tearing garments[119]:

רב הונא קרע שיראי באנפי רבה בריה , אמר: איזול איחזי אי רתח אי לא רתח ...והא קעבר משום בל תשחית ! דעבד ליה בפומבייניי. (תלמוד בבלי מסכת קידושין דף לב עמוד א)

> *Rav Huna tore the garment of his son, Rabbah, to test whether his son would control his anger… "but[the Talmud objects], he's violating bal tashchit!" [the Talmud answers] he tore it on the seams [so it could be easily repaired] "*

Burying valuable and useful items along with the dead[120]:

> כל המרבה כלים על המת הרי זה עובר משום בל תשחית דברי רבי מאיר (מסכתות קטנות מסכת שמחות פרק ט הלכה כג)

> *Rabbi Meir said, all who bury useful items along with the dead violate bal tashchit.*

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[118] The only extant complete manuscript of the Jerusalem Talmud is today part of the Leiden University Library collection.

[119] B.T. Kiddushin 32a.

[120] *Masechet Semahot*, ed. Michael Higger (New York, 1931), p. 178 and/or *The Tractate 'Mourning'* (*Semahot*), trans. Dov Zlotnick, (New Haven and London, 1966), pp. 72 and 206 (29).

Animate objects

Human body – The Talmud clearly prohibits causing injury or damage to others or to their property[121]. Needlessly destroying *one's own* property is prohibited under the prohibition of *bal tashchit*[122]. The Talmud suggests that intentional self-inflicted injury also constitutes a violation of *bal tashchit*[123]. The Talmud further rules that allowing avoidable damage to occur to the body is included in the prohibition of *bal tashchit*. Preventing damage to the body takes precedence over preventing the destruction of other useful resources as indicated below[124]:

> אמר רב חייא בר אבין אמר שמואל: הקיז דם ונצטנן - עושין לו מדורה אפילו בתקופת תמוז. שמואל צלחו ליה תכתקא דשאגא, רב יהודה צלחו ליה פתורא דיונה, לרבה צלחו ליה שרשיפא. ואמר ליה אביי לרבה: והא קעבר מר משום בל תשחית! - אמר ליה בל תשחית דגופאי - עדיף לי. (תלמוד בבלי מסכת שבת דף קכט עמוד א)
>
> *If one lets blood and catches a chill, a fire may be made for him even in Tammuz [peak of the summer]. A chair made of shaga [a type of expensive wood] was broken up [to make a fire] for Samuel; a table of juniper wood was broken up for Rav Judah. A footstool was broken up for Rabba. Abaye said to Rabba, "but you are violating bal tashchit!" Rabba replied that "bal tashchit of the body is more important to me"*

Blood-letting was a common medical procedure at the time of the writing of the Talmud[125], and was known to temporarily weaken the patient, without directly endangering his life. Nevertheless, since the weakened patient has an increased risk of illness, the health of his body takes precedence over the conservation of even very expensive material possessions such as those listed above.

The above example described exceptional circumstances where there was no alternative to destroying expensive household furniture in order to safeguard human life. The following example demonstrates that even in less urgent situations, the importance of maintaining optimal health takes precedence over the conservation of other resources[126]:

> ואמר רב חסדא: האי מאן דאפשר ליה למיכל נהמא דשערי ואכל דחיטי - קעבר משום בל תשחית. ואמר רב פפא: האי מאן דאפשר למישתי שיכרא ושתי חמרא - עובר משום בל תשחית. ולאו מילתא היא, בל תשחית דגופא עדיף. (תלמוד בבלי מסכת שבת דף קמ עמוד ב)
>
> *Rav Hisda said, one who could eat barley bread and instead eats wheat bread (more expensive) violates bal tashchit. Rav Papa said, one who could drink beer, but instead drinks wine (more expensive) violates bal tashchit. But [in reality] this is not so, because bal tashchit of the body is more important.*

---

[121]The fourth of the six orders of the Mishnah is called *Nezikin* or Damages. Along with the associated Gemara (commentary), the order of Nezikin forms a major part of both the Babylonian and Jerusalem Talmud. In particular, three tractates of the order of Nezikin: *Baba Kama, Baba* Metzia and *Baba Batra* focus on preventing or redressing damages to others.

[122] R. Moshe Yitzchak Vorhand, *Birchat Hashem* (Jerusalem, 2000), p. 125; R. Yitzchak Eliyahu Shtasman, *Aitz Hasadeh*, (Jerusalem, 2000), p. 73.

[123]B.T. Baba Metzia 91b.

[124]B.T. Shabbat 129a.

[125] See for example B.T. Brachot 31a, 57a; Shabbot 129b; Sotah 22b; and Niddah 17a. For additional information on blood-letting and other remedies commonly used in Talmudic times see Julius Preuss, *Biblical and Talmudic Medicine*, trans. and ed. Fred Rosner (Northvale, N.J., 1993), pp. 33-35, 248-257.

[126]B.T. Shabbat 140b.

These passages indicate that it is more important to preserve the health of the body, by eating healthier foods (wheat and wine were considered more healthful than the less expensive barley and beer) -- than conserving (monetary) resources by eating less expensive food. These passages also imply that aesthetic considerations alone were not sufficient to justify spending more resources (money in this case). The fact that wheat bread or wine might have tasted better was not given consideration.

Animals – The Talmud considers the unnecessary killing of animals to be a violation of *bal tashchit*. For example, the Talmudic sage Rebbi refused to destroy a certain type of animal living on his property, despite the potential danger they posed, because he considered killing them to be a violation of *bal tashchit*[127].

Economic considerations

The Talmud stresses the important role that economic utility plays in the prohibition of *bal tashchit*[128].

> אמר רב: דיקלא דטען קבא - אסור למקציה. מיתיבי: כמה יהא בזית ולא יקצצו? רובע! שאני זיתים, דחשיבי. א"ר חנינא: לא שכיב שיבחת ברי, אלא דקץ תאינתא בלא זמנה. אמר רבינא: ואם היה מעולה בדמים - מותר. (תלמוד בבלי מסכת בבא קמא דף צא עמוד ב)

> *Rav said, "It is forbidden to destroy a date tree that yields [at least] a kab (a volume of approximately 2.2 liters) of fruit." [The Talmud cites an objection] "What is the minimum yield for an olive tree to prohibit its destruction"? "¼ kab". [The Talmud resolves the difficulty] "Olives are different, since they're more valuable." Rav Hanina said "Shivchat my son died [prematurely] because he cut down a fig tree before its time". Ravina said, "If [the fruit-producing tree] is worth more [when cut down] then it is permissible [to cut it down]".*

A fruit-producing tree must yield at least a minimal amount of fruit to be considered a valuable resource that is protected by the prohibition of *bal tashchit*. If a competing usage of the tree provides more economic utility (מעולה בדמים), even if it results in the destruction of the tree, (for example, using the tree as a source of wood for building) then it is permitted to cut down even a fruit tree for this use. The operative factor is the usage of the resource that yields the greatest economic utility – as will be further discussed below in section 3.2.2.5D.

Similarly, the Talmud teaches[129]:

> רב חסדא חזא תאלי בי גופני, אמר ליה לאריסיה: עקרינהו, גופני קני דקלי, דקלי לא קני גופני. (תלמוד בבלי מסכת בבא קמא דף צב עמוד א)

> *Rav Hisda saw a date palm tree growing amongst the grape vines. He told his laborer[130] to uproot it, saying, grape vines acquire [because of their higher economic value] date trees but date trees don't acquire grape vines.*

[127] B.T. Chullin 7b.
[128] B.T. Baba Kama 91b.
[129] B.T. Baba Kama 92a.
[130] An 'aris' is an agricultural laborer who receives a percentage of the produce of the fields he labors on as his pay.

The date palm tree was damaging the more valuable grape vines. Since the grape vines were of greater economic value, (and therefore they 'acquire' the date palm tree) Rav Hisda instructed his laborer to remove the date palm tree. Note that Rav Hisda instructed his laborer to *uproot* the date palm tree rather than cut it down, which may indicate that he intended for the date palm tree to be replanted in another location rather than to be destroyed (see section 3.2.3 below).

Metaphysical Danger to one who destroys a fruit-producing tree

While the Talmud rules that it is permissible to destroy a fruit-producing tree for the sake of greater economic utility, the same passage reveals a different, metaphysical aspect of *bal tashchit* – the mortal danger placed upon one who destroys a fruit-producing tree (*Rav Hanina said "Shivchat my son died [prematurely] because he cut down a fig tree before its time)*. This is reiterated in another Talmudic passage[131]:

> רבא בר רב חנן הוו ליה הנהו דיקלי אמיצרא דפרדיסא דרב יוסף , הוו אתו צפורי יתבי בדיקלי ונחתי בפרדיסא ומפסדי ליה; א"ל: זיל קוץ, א"ל: והא ארחיקי לי ! א"ל: ה"מ לאילנות, אבל לגפנים בעינן טפי . והא אנן תנן : אחד גפנים ואחד כל אילן ! א"ל: ה"מ אילן לאילן וגפנים לגפנים , אבל אילן לגפנים בעינן טפי . א"ל: אנא לא קייצנא, דאמר רב: האי דיקלא דטעין קבא - אסור למקצייה, ואמר ר' חנינא: לא שכיב שכחת ברי , אלא דקץ תאנתא בלא זימניה, מר אי ניחא ליה ליקוץ. (תלמוד בבלי מסכת בבא בתרא דף כו עמוד א)
>
> *Raba, son of Rav Hanan had date trees next to a vineyard of Rav Yosef. Birds used to roost in the date trees and fly down and damage the vines [of Rav Yosef]. Rav Yosef told him [Raba] "Go cut them [the date trees] down!"..... Raba said, "I won't cut them down because Rav has said that it is forbidden to cut down a date tree that yields [at least] a kab of dates and Rav Hanina said 'My son Shivchat only died because he cut down a fig tree before its time'. You sir can cut it down if you want."*

Many questions are raised by this mysterious aspect of *bal tashchit*. Does the danger remain irregardless of whether the tree is cut down in a permitted way or the tree is 'needlessly' destroyed? Does the danger affect only the one cutting down the tree or are others likewise affected? Are there ways of circumventing the danger? The answers to these questions are not directly answered in the Talmud, and are discussed in later Rabbinic sources as will be presented in section 3.2.2.3.

Inefficient usage of resources

The Talmud prohibits, under the prohibition of *bal tashchit*, the *inefficient* usage of important resources such as fuel[132]:

> אמר רב זוטרא : האי מאן דמיכסי שרגא דמשחא ומגלי נפטא - קעבר משום בל תשחית . (תלמוד בבלי מסכת שבת דף סז עמוד ב)
>
> *Mar Zutra said, one who covers an oil lamp [causing the flame to burn inefficiently] or uncovers a kerosene lamp [allowing the fuel to evaporate faster] violates the prohibition of bal tashchit.*

[131]B.T. Baba Batra 26a.
[132]B.T. Shabbat 67b.

Moral-ethical aspect of *bal tashchit*

Finally, the Talmud teaches that there is a moral-ethical aspect of *bal tashchit that goes beyond violating a prohibition of Jewish law*:

> רבי שמעון בן אלעזר אומר משום חילפא בר אגרא , שאמר משום רבי יוחנן בן נורי : המקרע בגדיו בחמתו , והמשבר כליו בחמתו, והמפזר מעותיו בחמתו - יהא בעיניך כעובד עבודה זרה (תלמוד בבלי מסכת שבת דף קה עמוד ב).

> *Whoever tears garments in anger, breaks vessels in anger, and scatters money in anger should be regarded in your eyes as an idolater*[133]"

Idolatry is an extremely serious transgression in Jewish law. There is Rabbinic disagreement as to the nature of the transgression being compared here to idolatry – whether it is causing needless destruction (*bal tashchit*) or acting from uncontrolled anger. According to at least one major Talmudic commentator, the transgression that is being compared to idolatry is *bal tashchit*[134].

[133]B.T. Shabbat 105b.

[134]R. Shmuel Eliezer Edels (1555-1631), known as the "Maharsha" in his commentary on the Talmudic tractate Shabbat 105b clearly identifies the transgression as *bal tashchit*.

3.1.3 Savoraim-Gaonim - end of fifth century to mid eleventh century

The heads of Babylonia's two main Talmudic academies, located in Sura and Pum-bedita, were referred to as the *Gaonim*. Although many of their writings have been lost, the Gaonim did bequeath to us several important manuscripts. The first annotated prayer book dates from this period, as do a number of legal collections which both summarize and supplement the Talmud's teachings. Historian B.M. Levin summarizes the period as follows[135]: *[The Gaonim] guarded [the Talmud's] integrity in their yeshivot with zealousness and devotion. Therefore, the Gaonim can be considered the true custodians of the tradition of the Talmud. All of the scholarship of the Gaonim in Babylonia, the place where the Talmud was created and developed over centuries, should be viewed as one long signature and final editorial redaction of the subject matter of the Talmud.*

According to one contemporary source, there is a Gaonic era in Jewish history but not in Jewish law, since there is no authoritative book that was accepted as the end of that era[136]. My search through the major published works that remain from the period of the Saboraim and Gaonim failed to reveal anything novel on the prohibition of *bal tashchit*[137].

[135]B.M. Levin, *Otzar HaGaonim* (Jerusalem 1984), vol. 1, pp. i-ii.

[136] Soc.Culture.Jewish Newsgroups; *Frequently asked Questions and Answers – Question 4.3 – Traditionally, what are the different Rabbinic eras?*, available at: shamash.org/lists/scj-faq/HTML/faq/04-03.html and www.faqs.org/faqs/judaism/ FAQ/03-Torah-Halacha/section-52.html.

[137]A computer search was conducted (using the Bar Ilan University Responsa – Global Jewish Database, version 14) for the word *תשחית* (which would include the possible forms in which *bal tashch*it might appear - both בל תשחית and לא תשחית). The CD contained the digitalized version of the following texts: *Halachot Ketzuvot*; Margaliyyot edition, (Jerusalem, 1942), *Ha-Chillukim*; Margaliyyot edition, (Jerusalem, 1938), *Mishpetei Shevuot*; (Jerusalem, 1960, reprint of Hamburg, 1782), *Seder Rav Amram Gaon*; Harpanas edition, (Bnei Brak, 1994), *She'iltot De-Rav Achai*; (Venice, 1546), *Sefer Ha-Shetarot*; S. Assaf edition, (Jerusalem, 1930), *Teshuvot Ha-Ge'onim Ha-Chadashot*; S. Emanuel edition, (Jerusalem: Machon Ofek, 1995), *Teshuvot Ha-Ge'onim*; B. Musafia edition; (Lyck, 1864), *Teshuvot Ha-Ge'onim*, Sha'arei Tzedek; Salonika,1792, repr. Jerusalem, 1966, *Teshuvot Ha-Ge'onim Sha'arei Teshuvah*; Livorno, 1869, Leipzig, 1858, *Teshuvot Ha-Ge'onim*, Avraham Eliyahu Harkavy; (Berlin, 1887), *Teshuvot Rav Natronai Ga'on*, ed. Brody; Ofek edition, (Jerusalem 1994), *Halachot Gedolot*; Machon Yerushalayim, (Jerusalem, 1992), *Teshuvot Ge'onim Kadmonim*; Cassel edition, (Berlin, 1848), *Teshuvot Ha-Ge'onim*, ed. Coronel; (Vienna, 1871), *Ge'onei Mizrach U-Ma'arav*, Joel Mueller edition, (Berlin, 1888), *Iggeret Rav Sherira Gaon*, R. David Metzger edition, Neve Asher Institute, (Jerusalem, 1998), *Seder Tanna'im Va-Amoraim*, R. David Metzger edition, Neve Asher Institute, (Jerusalem, 1998), *Shaarei Tzedek, Teshuvot HaGeonim Babylonian Geonim, (Salonika*, 1792; repr. Jerusalem, 1966).

3.1.4 Rishonim (eleventh to mid sixteenth centuries)

In the first half of the second millenium, there was a new phase of Jewish thought and jurisprudence. Leading scholars of this new phase included R. Moshe ben Maimon (Maimonides), R. Moshe ben Nachman (Nachmanides) and R. Abraham Ibn Ezra who all spent part of their lives in Spain. Outstanding scholars such as R. Shimon ben Yitzchak (Rashi) and the Tosaphists lived in France. The scholars of this era are known in Jewish tradition as the *Rishonim*, or the 'first ones', in contradistinction to the *Acharonim* or 'later ones' described in the next section.

The first systematic codifications of Jewish law date to the period of the *Rishonim*. In addition, the much of the classical commentary on the Tanach as well as on the oral tradition was written during this period. The period of the Rishonim also saw a flowering of classic Jewish philosophical works by scholars such as Maimonides, R. Solomon Ibn Gabirol, and R. Yehuda HaLevi.

Increasing the scope of application of *bal tashchit*

It appears that until the Rishonim, the major emphasis of the prohibition of *bal tashchit* was on actions that *directly* caused the unnecessary destruction of resources. Maimonides (1165-1204), one of the first codifiers of Jewish law, included *indirect* destruction of useful resources – such as interfering with a spring that irrigates a tree, indirectly causing the destruction of the tree[138] – in his codification of the prohibition of *bal tashchit*[139]:

> ולא האילנות בלבד , אלא כל המשבר כלים , וקורע בגדים , והורס בנין , *וסותם מעין* , ומאבד מאכלות דרך השחתה, עובר בלא תשחית. (רמב"ם הלכות מלכים פרק ו הלכה י)

> *Not only one who cuts down trees, but also one who needlessly breaks household goods, tears clothes, demolishes buildings,* stops up a spring*, or destroys articles of food violates the command of bal tashchit* (emphasis added).

In the words of Y.M. Stern[140]:

> הרמב"ם חידש לנו פה ענין גדול מאוד בענין בל תשחית , שבפשטות אנחנו לא מוצאים את זה בשאר דיני התורה, לכאורה כאן זה יותר חמור מאיסורים , שבגדר חיובי כריתות וחיובי מיתית בי "ד, "בל תשחית" זה לא דווקה אם אדם לו קח גרזן והוא קוצץ את האילן , אלא כאמור אפילו אם הוא רק גורם להשחית את הדבר , הוא רק מטה את אמת המים ועי "ז האילן מתייבש – גם זה בכלל לאו דאורייתא . אנחנו ראויים פה שבענין של "בל תשחית" זה דבר מיוחד שהתורה כ"כ הקפידה על הענין הזה כדי שלא יושחת דבר.

> *Maimonides introduces an amazing novellum in the prohibition of bal tashchit, that we don't seem to find anywhere else in Torah law. The law of bal tashchit appears to be stricter in some ways than even the most serious prohibitions (such as murder and*

[138]Maimonides, *Mishneh Torah*, ed. S. Frankel (Jerusalem and B'nei Braq, 1998), Laws of Kings 6:10, vol. 12, pp. 263-264.

[139] This should not be confused with the Talmudic prohibition of causing a lamp to burn inefficiently by covering or uncovering the fuel while it is burning (see section 1.2.5). In the case of the lamp, the person is still directly causing the fuel to burn inefficiently, whereas in the case of stopping up the spring, the resulting destruction of the tree only comes about indirectly and over a period of time.

[140]Y.M. Stern as quoted in: R. Yitzchak Zilberstein, 'Observations on *Bal Tashchit*,' *Zohar: Kovetz Torani*, (1988), p. 69.

idolatry). Bal tashchit is not specifically limited to a person taking an axe and cutting down a tree [as would be suggested by the Biblical verses], but even if he causes the destruction of an object [such as] by diverting the flow of water to a tree and indirectly causes it to dry out, this is also included in the Biblical prohibition. We see here that the Torah is especially careful with the matter of bal tashchit, in order to avoid unnecessarily destroying anything of value.

Stern's statement is surprising, considering that Maimonides is apparently basing himself on a much earlier source, the Sifrei, (second century C.E.)[141]:

לא תשחית את עצה לנדוח עליו גרזן , אין לי אלא גרזן מנין אף למשוך הימנה אמת המים תלמוד לומר לא תשחית את עצה בכל דבר. (ספרי דברים פיסקא רג ד"ה להלחם עליה)

"*Do not destroy its tree, by swinging an axe against it;" [from this] I only know [not to destroy with an] axe. From where [do I know] not even to draw away from it a water channel? The Torah says "don't destroy its tree" – with any thing [that could cause the tree to be destroyed]*.

Despite Stern's apparent omission of the earlier source for this ruling, the ruling that the prohibition of *bal tashchit* extends even to causing *indirect* damage is exceptional, as Stern writes. Jewish law generally exempts indirect causes (גרמא) from legal consequences[142]. Maimonides inclusion of "stopping up a spring" in his ruling on *bal tashchit* can be seen as bringing emphasis to this aspect of the prohibition.

In another remarkably broad and far-reaching statement, Maimonides writes[143]:

... וכן *כל הפסד* נכנס תחת לאו זה כגון מי שישרוף בגד לריק או ישבר כלי לריק . (ספר המצוות לרמב"ם מצות לא תעשה נז)

... And similarly, every loss *enters into this prohibition [of bal tashchit], for example, one who needlessly burns a garment or needlessly breaks a vessel (emphasis added).*

Here, Maimonides gives perhaps the broadest possible definition of *bal tashchit*. Any action which will result in an *unnecessary loss* enters into the realm of the prohibition. Maimonides does not clarify exactly what he means by a *loss.* The inclusiveness of his statement כל הפסד (every loss) seems to imply that this would include a loss of value and/or a loss of utility of the object in addition to the total destruction of the object itself. Maimonide's use of the word לריק (literally "for emptiness") implies destruction where there is no commensurate benefit to offset the loss.

To put Maimonide's words in more modern terms, we could say that any activity likely to result in a negative benefit-cost ratio[144] (producing less benefits than the costs) may violate the prohibition of *bal tashchit*. This was already suggested by the Talmudic concept of 'מעולה בדמים' (favoring the use that gives greater economic utility) as described above in section 3.1.2.

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[141] *Sifrei on the book of Deuteronomy*, ed. Eliezer Arieh Finkelstein (New York and Jerusalem, 1993), p. 239.
[142] See for example "Gramma b'Nizikin", in Anon., 'G'ramma beNezikin (Indirect Damage),' *Talmudic Encyclopedia*, ed. R. Shlomo Yosef Zevin (Jerusalem, 2001), vol. 10, cols. 461-464.
[143] Maimonides, *Sefer Hamitzvot*, ed. S. Frankel (Jerusalem, B'nei B'raq, 1995), negative command no. 57, p. 308.
[144] See chapter 5 (section 5.2.3.6) for more discussion on this point.

Similar to the position of Maimonides above, Rashi, in his commentary on the Talmud, implies that a destructive act which causes an item to *lose value*, even though the item is not destroyed, is also included in the prohibition of *bal tashchit*. The Talmud brings the case (see section 3.1.2 above) of a Torah scholar who tears the garment of his son as a test to see if his son can control his anger. The Talmud questions the permissibility of the Torah scholar damaging a valuable garment for such a reason, and concludes that it must be that he tore it on its seams (so that is was repairable). Rashi takes this a step further, explaining that tearing the garment on its seams [not only left it repairable, but also] avoided causing the garment to *lose its monetary value*, and therefore, there was no violation of *bal tashchit*[145].

Maimonides also indicates that – at least in the case of fruit-producing trees – the subjective judgement of the one doing the act is not sufficient to justify destroying the tree. He writes that the fact that the benefits outweigh the costs must be clear to others as well[146]:

> ומותר לו לקצוץ האילן, ובתנאי שיש לו דמים כלומר לעציו ואז מותר לקצצו, אבל אם לא היה לעציו דמים מרובים עד כדי שיאמרו שיותר מועיל לקצצו מלהשאירו הרי זה אסור לקצצו כיון שהוא עושה פירות, לפי שקציצת אילני מאכל אסורה מן התורה בכל זמן זולתי בתנאים שאמרנו, והוא מאמר ה' לא תשחית את עצה. (פירוש המשנה לרמב"ם מסכת שביעית פרק ד משנה י)

> *It is permissible to cut down a tree as long as its wood is more valuable [than its fruits]. If, however, its wood will not fetch a sufficiently higher price to* cause others to say "it was worth more for him to cut it down then to leave it standing"*, then it is forbidden for him to cut it down because it [the tree] bears fruits and the Torah always forbids cutting down fruit-producing trees outside of the conditions we have given, and these are the words of the Creator 'don't destroy the tree* (emphasis added).

In other words, according to Maimonides, it is not enough that the value of the wood be *slightly higher* than the value of the fruits the tree will produce, but the value of the wood has to be sufficiently higher that it is obvious to others – and only then is it permissible to cut down the tree[147].

Clarification of whether the prohibition of *bal tashchit* applies primarily to the object itself or to the value contained in the object

The Rishonim endeavored to further clarify the prohibition of *bal tashchit* and determine whether it applies directly to an object or to the value contained in the object. Contemporary scholar R. Gavriel Bekhhofer[148] writes that according to the position of Maimonides, the focus of the prohibition is on preventing the destruction of the object itself. According to this position, the destruction or degradation of an object is permitted only where there will be greater direct benefit from the object in its new form than its previous form. For example, a fruit-producing tree can only be cut down if its newly-available wood provides greater benefit than the fruit production would have provided. Destroying the tree for the sake of *indirect* benefits – such as the demoralization of a besieged enemy – would be prohibited according to this position[149]. It appears to me that Maimonides' position, which Bekhhofer quotes, is particular to fruit-producing trees, and not to other objects, where Maimonides' words are more ambiguous. For example, in

[145] B.T. Kiddushin 32a: commentary of Rashi.
[146] Maimonides, *Commentary on the Mishnah*, ed. Yosef Kapah, Seder Zeraim, Shviit 4:10, p.148.
[147] Vorhand, p.57.
[148] R. Yosef Gavriel Bekhhofer, 'Recycling in Halacha,' *Techumin*, 12 (1996), p.297.
[149] Maimonides, *Sefer Hamitzvot*, ed. S. Frankel (Jerusalem, B'nei B'raq, 1995), negative command no. 57, p. 308.

the same reference, Maimonides writes[150]: *... And similarly,* every loss *enters into this prohibition [of bal tashchit], for example, one who needlessly burns a garment or needlessly breaks a vessel*. Here, Maimonides seems to switch the emphasis to the value contained in the object, with his words *"every loss enters into this prohibition [of bal tashchit]"*. Maimonides, in my opinion, is giving extra protection to fruit-producing trees than to other objects.

Other Rishonim, such as R. Moses ben Jacob of Coucy[151] (the"Smag" – early 13th century), R. Eliezer ben Shmuel of Metz[152] (the "Yereim" - mid to late 12th century) and R. Isaiah of Trani (the Tosefot HaRid – 13th century), seem to place the focus of *bal tashchit* on preventing the degradation of the value of an object, rather than on the object itself, without making Maimonides' differentiation between fruit-producing trees and other objects. Therefore, an overall profit, even if not coming directly from the destruction of the object, would permit the destructive act. For example, R. Isaiah of Trani discusses the Talmudic case of a valuable but non fruit-producing tree growing in the same location as a less valuable fruit-producing tree. He writes, in his commentary on B.T. Baba Kama 92a[153]:

> יכול נקוץ הסרק קודם כדי שלא נשחית פירותיו של זה ת"ל רק שקודם נקוץ אילן מאכל שאין בו השחתת דמים כל כך ממה שנקוץ אילן סרק שיש בו השחתת דמים שלא הקפידה תורה על השחתת פירות אלא על השחתת דמים ... ואדמים קפדה רחמנא טפי מאכילת פירות. (תוספות רי"ד מסכת בבא קמא דף צב עמוד א)
>
> *We might think that we should cut down the barren tree first in order not to destroy the fruits of this one [of the fruit tree]… [however] we cut the fruit tree first, because there will be less destroyed monetary value ("damim") than if we cut the barren tree... the Torah is more concerned with the monetary value than with eating the fruits.*

The view that *bal tashchit* applies to protecting the value of an object seems to be prevalent amongst the Rishonim. Maimonides may be unique amongst the Rishonim in assigning a special status to fruit-producing trees so that the prohibition applies to preventing the destruction of the trees themselves and not just their value.

Human Body

The Rishonim also furthered the discussion of *bal tashchit* of the human body. R. Jonah ben Avraham Gerondi (13th century) writes that the body of a human being is considered part of the creation and therefore causing unnecessary harm or damage to the human body is a violation of *bal tashchit*[154].

Wasting money

Some Rishonim included wasting money on non-necessities in the prohibition of *bal tashchit*. For example, R. Yosef Caro (1488-1575), who bridged the period between the Rishonim and the Acharonim) warned communities against employing enforcers to forcibly bring recalcitrant legal

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[150] Ibid.

[151] R. Moshe of Coucy , *Sefer Mitzvot Gadol*, ed. Alter Pinchas Farber ([B'nei B'raq?], 1991), Negative Prohibitions, Laws of Kings, sect. 229, p.211.

[152] R. Eliezer of Metz, *Sefer Yereim*, eds. Yisrael Isser Goldblum and Shlomo Zalman Chaim Halberstam (Jerusalem, 1995, reprint of Vilna, 1902), sect. 382 (297), pp.401-402.

[153] R. Isaiah of Trani, *Tosefot Rid* (Lvov, 1862), p. 6b.

[154] R. Jonah Gerondi, *Sha'arei Teshuvah*, ed. Moshe Karelitz (Jerusalem, 1996), chapter 3:82, p. 72. Acharonim, such as R. Schneur Of Ladi developed this theme further – see section 3.1.5.

offenders to court. That money could be saved, he reasoned, by employing various other legal threats, such as excommunication, in order to prevent delinquency. Therefore, he writes, even the small salary of a court officer in a large city budget could legitimately be considered *bal tashchit* if other, less expensive means are available to accomplish the same purpose[155].

R. Menachem ben Solomon Meiri (1249-1316) writes that what is considered *bal tashchit* of money is dependent on one's financial situation[156]. According to R. Meiri, a poor person who spends his money on more than the basic essentials may violate bal tashchit, whereas a wealthy person spending on more than the basic essentials wouldn't necessarily be considered violating *bal tashchit*.

Moral-ethical aspects of *bal tashchit* in the Rishonim

Aside from the material and utilitarian side of *bal tashchit*, the Rishonim also stressed the moral-ethical aspects of *bal tashchit*. Maimonides writes[157]:

> מלמדין את האדם שלא יהא חבלן ולא יפסיד את הכלים וישליכם לחבלה , מוטב לתתם לעניים ואל ישליכם לרמה ותולעה, וכל המרבה כלים על המת עובר בלא תשחית. (רמב"ם הלכות אבל פרק יד הלכה כד)

> *One should be trained not to be destructive. When you bury a person, do not waste garments by burying them in the grave. It is better to give them to the poor than to cast them to worms and moths. Anyone who buries the dead in an expensive garment violates the prohibition of bal tashchit.*

The prohibition of burying valuable and useful items with the dead was already introduced in the Talmud (see section 3.1.2 above). Maimonides connects the prohibition with a moral-ethical imperative to teach people not to be destructive.

According to the author of the *Sefer HaChinuch* (14th century)[158]:

> וזהו דרך החסידים ואנשי מעשה אוהבים שלום ושמחים בטוב הבריות ומקרבים אותן לתורה, ולא יאבדו אפילו גרגר של חרדל בעולם, ויצר עליהם בכל אבדון והשחתה שיראו, ואם יוכלו להציל יצילו כל דבר מהשחית בכל כחם, ולא כן הרשעים אחיהם של מזיקין שמחים בהשחתת עולם. (ספר החינוך מצוה תקכט)

> *This is the way of the pious and elevated people; they love peace and rejoice in [seeing] good for other people, and in bringing them near to The Creator's way. They will not waste even a mustard seed, and they are distressed at every ruination and spoilage they see. If they are able to save [something], they will save it from destruction with all of their power. Not so, however, are the wicked, the brethren of destructive forces that rejoice at the destruction of the world.*

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[155] R. Yosef Caro, *Sefer Avkat Rochel* (Leipzig, 1859, reprinted Jerusalem 1997), responsum 18, p.19, col. 2.

[156] R. Menachem HaMeiri, *Beit haBechirah leRabbeinu haMeiri*, ed. Isaak S. Lange (Jerusalem, 1968), vol. 2 (Shabbat), p. 552.

[157] Maimonides, *Mishneh Torah*, ed. S. Frankel (Jerusalem and and B'nei Braq, 1998), Laws of Mourning 14:24, vol. 12, p. 244.

[158] R. Aharon HaLevi of Barcelona (?), *Sefer HaChinuch*, ed. Chaim Dov Chavel (Jerusalem,1990), commandment 529, pp.647-648. This work describes the commandments according to the order of their giving in the Torah, along with explanations and reasons for the commandments.

R. Moshe Cordovero (1522-1570), who lived between the period of the Rishonim and the Acharonim, expresses the moral-ethical imperative not to be destructive, which is embodied in *bal tashchit*, in the following words[159]:

עוד צריך להיות רחמיו פרוסים על כל הנבראים , שלא יבזם ולא יאבדם . שהרי החכמה העליונה היא פרוסה על כל הנבראים, דומם וצומח וחי ומדבר . ומטעם זה הוזהרנו מביזוי אוכלים . ועל דבך זה ראוי שכמו שהחכמה העליונה אינה מבזה שום נמצא והכל נעשה משם, דכתיב (תהלים ק"ד, כ"ד): "כולם בחכמה עשית", כן יהיה רחמי האדם על כל מעשיו יתברך. ומטעם זה היה עונש רבינו הקדוש, על ידי שלא חס על בן הבקר שהיה מתחבא אצלו ואמר לו : "זיל לכך נוצרת" (בבא מציעא פ"ה, א'), באו לו יסורין, שהם מצד הדין, שהרי הרחמים מגינים על הדין, וכאשר רחם על החולדה ואמר : "ורחמיו על כל מעשיו כתיב ", ניצל מן הדין, מפני שפרש אור החכמה עליו , ונסתלקו היסורים: ועל דרך זה לא יבזה שום נמצא מן הנמצאים , שכולם בחכמה, ולא יעקור הצומח אלא לצורך , ולא ימית הבעל חי אלא לצורך , ויברור להם מיתה יפה בסכין בדוקה, לרחם כל מה שאפשר: זה הכלל: החמלה על כל הנמצאים שלא לחבלם , תלויה בחכמה. זולתי להעלותם ממעלה אל מעלה : מצומח לחי, מחי למדבר - שאז מותר לעקור הצומח ולהמית החי , לחוב על מנת לזכות . (ספר תומר דבורה - פרק שלישי)

> *One's mercy should extend over all creations, not to treat them disrespectfully or destroy them. For the Higher Wisdom is spread upon all creations, [including] inanimate matter, plants, live creatures and people. And for this reason, we are warned against treating food disrespectfully. Along these lines, it is befitting that just as the Higher Wisdom does not disdain any creature, and causes everything, as it is written: "You made them all with wisdom" (Psalms 104:24), so should man's mercy be upon all The Creator's works… Along these lines, a person should not treat anything disrespectfully, for all were made with wisdom. He should not uproot a plant except where necessary, and he should not cause the death of a living creature except where necessary, in which case he should ensure them an easy death, with a checked [properly sharpened] knife, to be as merciful as possible. This is the general principle: Having compassion on every being, in order not to destroy them is dependent on wisdom. The exception is to elevate them to a higher level – from plant to animal, from animal to human – for that purpose it is permissible to uproot plant life and to kill animal life, to take away [in the short term] in order to benefit [in the long run].*

R. Cordovero's statement is representative of a Kabbalistic perspective on *bal tashchit*. This perspective is remarkable for several reasons. First, is the inclusion of all of the creation, including inanimate material, within the moral-ethical obligation to be merciful and not to be destructive or disrespectful. Second, this perspective makes this required sensitivity for all of the creation dependent on both human and divine wisdom. Thirdly, this perspective reveals a new moral-ethical justification for man's right to destroy another part of the creation – that this can (if done properly) elevate the object to a higher level, and bring about long-term benefit to the object itself, as well as to man[160].

In addition, in describing the obligation to ensure an easy death, R. Cordovero links the prohibition of *bal tashchit* with another Biblical prohibition called *tza'ar ba'alei chayim*, which prohibits causing unnecessary pain to animals, as will be further discussed in section 3.2.2.4B.

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[159] R. Moshe Cordovero, *Tomer Devorah*, (Jerusalem, 1999), ch. 3, pp. 23-24.

[160] A similar perspective can be found in some of the works of R. Samson Raphael Hirsch, as presented in Appendix A (pp. 207-208).

3.1.5 Acharonim to Modern Times (mid sixteenth century onwards).

The climax of the codification efforts of the Rishonim was R. Yosef Caro's *Shulchan Aruch* (Code of Jewish Law), published in the 1560's. Caro's endeavor was all-encompassing, addressing most areas of Jewish life with a detailed set of laws gleaned from the leading Rishonim, such as Maimonides (the Rambam), Rav Alfasi (The Rif) and Rabbeinu Asher (The Rosh) and usually followed the majority opinion from amongst these three. The *Shulchan Aruch* inaugurated the era of the *Acharonim* (latter ones, in contradistinction to the *Rishonim* or first ones).

Despite the closure Caro's work provided, Jewish law had to adapt to new challenges unknown to previous generations. Hundreds of volumes of Responsa (Questions and Answers by Rabbinic authorities) have been authored since the publication of the *Shulchan Aruch* to address these challenges.

Leading scholars of this time include R. Eliyahu of Vilna (the Gaon of Vilna), R. Moshe Chaim Luzatto, R. Zalman of Liadi and R. Samson Raphael Hirsch, each of whom formulated a Jewish *Weltanschaung* based on the laws and traditions passed down from the previous generations.

Prohibition of *bal tashchit* in codifications of Jewish law during the early Acharonic period

Remarkably, the *Shulchan Aruch*, the authoritative Code of Jewish Law, hardly mentions the prohibition of *bal tashchit*. There are only two indirect references to *bal tashchit* in the entire codification[161]. This surprising omission is discussed amongst later Acharonim. For example, contemporary scholar R. Israel Gukavitzki writes[162]:

כי הלכה ומצוה שהם עיקרי הדת ויראה ואהבה ומצות יחוד וש לו לתור אחר הלב והעין ואהבת רעים ושמירת לבבו מאמונות רעות ודעות רעות כעס וגאוה נקימה לא העתיקו בחיבוריהם , כי כבר נתחברו על זה כמה ספרי יראה ומוסר חובת הלבבות וכיוצא, ומצוה זות שלא יהיה משחית וכעסן הוא מדעות בני אדם , והניחו אותו לספרים שנתייסדו על זה ולא שייך זה לחיבוריהם

> *Laws and commandments that are fundamental principles, such as awe and love of The Creator, loving others, and not acting in excessive anger were not included in the codifications of Jewish law. The commandment to not be a destructive or an excessively angry person are part of the proper traits of human beings and are left to books on that subject; they are not relevant to codifications of Jewish law*

Gukavitzki's explanation is difficult to understand when one considers that there are many technical aspects of *bal tashchit* (as will be discussed in section 3.2.2) that go beyond 'proper traits of human beings'. These technical aspects are part of normative Jewish law and one would expect them to appear in any code of Jewish law, such as the *Shulchan Aruch*. It might be suggested that the early Acharonic period was a time of material want in most Jewish communities. The vast majority of people simply could not afford to waste, and the prohibition of *bal tashchit* was seen to have little relevance (see section 3.1.6 for further discussion). Nevertheless, there were many

[161]Shulchan Aruch (Standard Format edition) (Jerusalem, 2005), Orach Chayim, vol. 1, 170:22, p.240, (concerning not wasting wine) and Yoreh Deah, vol. 4, 349:4, p.345 (discussing not burying the possessions of the deceased along with his body).

[162]R. Israel Gukovitzki, *A Guide to Weaving and Spinning in the times of Chazal* (London, 1982), cited in Yitzchak Zilberstein 'Observations on *Bal Tashchit*,' *Zohar: Kovetz Torani*, (1988), p.70.

other periods of material want in Jewish history and the omission of more comprehensive discussion of *bal tashchit* in the *Shulchan Aruch* remains puzzling.

Relationship between *bal tashchit* and preserving health

One of the codifiers of Jewish law during the early Acharonic period who did include *bal tashchit* in a more comprehensive manner than the *Shulchan Aruch* was R. Schneur Zalman of Liadi (1745-1813), known as the 'Ba'al HaTanya' and the founder of a Chassidic movement (Chabad). In his *Shulchan Aruch haRav*, he groups together the prohibition of *bal tashchit* with the requirements to preserve human life and health under the category of *laws of guarding life and the body and bal tashchit* as follows[163]:

כשם שצריך להזהר בגופו שלא לאבדו ולא לקלקלו ולא להזיקו כך צריך להזהר במאודו שלא לאבדו ולא לקלקלו ולא להזיקו וכל המשבר כלי או קורע בגד או הורס בנין או סותם מעין או מאבד מאכלות או משקין או ממעסם וכן המקלקל שאר כל דבר הראוי ליהנות בו בני אדם עובר בל"ת

> *Just as a person needs to take care of his body so that he does not destroy or damage it, so he needs to take care of his material possessions so that he does not destroy or damage them. All who break vessels, tear clothing, destroy buildings, stop up water sources or destroy or degrade [edible] food or drink, and similarly, all who damage any object others could benefit from, violate bal tashchit.*

More recently, R. EphraimWeinberg (1912-1964), writes[164]:

לפי חז"ל (שבת קכ"ט א')אדם המזניח הבראת גופו בזמן מחלה או חולשה עובר הוא על איסור מן התורה "בל תשחית דגופא". כן אם אינו מרשה לעצמו לאכול מאכלים המועלים להבראתו ולחיזוק גופו , אף שהם יקרים, עובר הוא על הלאו הנ"ל

> *According to the Sages (B.T. Shabbot 129a) a person who neglects the healing of his body during a time of illness or weakness violates the Torah prohibition of "bal tashchit of the body". Similarly, if he doesn't allow himself to eat proper foods that benefit his health and strengthen his body, even if [the healthy food] is expensive, he is violating this prohibition [of bal tashchit].*

While R. Shneur Zalman of Liadi focuses on the general prevention of damage or destruction to the body or to material resources, R. Weinberg's ruling focuses on those who neglect their body during a time of illness or weakness, when the body needs to heal. It is not clear from R. Weinberg's ruling whether one who neglects to take preventative measures to guard his health, even when healthy, is in violation of *bal tashchit*, as suggested by R. Shneur Zalman's ruling. On the other hand, R. Weinberg rules that, at least in the case of someone who is ill, the prohibition of *bal tashchit* requires spending more money, if necessary, to buy foods that are better for his body.

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[163] R. Shneur Zalman of Liadi, *Shulchan Aruch HaRav* (NewYork, 1974), sect. 6, *Hilchot Shmirat Hanefesh v'haguf v'bal tashchit* 14, p. 1775.

[164] R. Ephraim Weinberg, *Yad Ephraim* (Tel Aviv, 1976),14:7, p.154.

Differentiating between needs and luxuries

Some Acharonim stress the importance of differentiating between necessities and luxuries in their rulings on *bal tashchit*, particularly concerning fruit-producing trees. R. Yair Chaim Bachrach (1638-1702) rules that enlarging one's yard, creating a garden, creating a walkway or making available more sunlight in ones yard are not sufficient reasons for cutting down a fruit-producing tree[165].

Similarly, R. Ovadia Yosef (b.1921), former Chief Sephardic Rabbi of Israel and currently a leading legal authority – when asked about the permissibility of cutting down a fruit-producing tree in order to expand a house – ruled that[166]:

סוף דבר הכל נשמע , שהעיקר להלכה שמותר לקצוץ אילני מאכל כדי להרחיב דירתו אשר היא כיום דחוקה ומצומצמת למשפחה ברוכת הילדים ה' עליהם יחיו, ואין בזה חשש סכנה כלל , ועל צד היותר טוב נכון לשכור גוי לקצוץ האילנות . ומכל מקום אם מרחיב דירתו לטיול ולהרוחה בעלמא, או לנוי וליופי, אין להתיר קציצת האילנות בשביל כך,

> *In conclusion, it is permissible to cut down a fruit-producing tree in order to enlarge an overcrowded apartment to meet the needs of a large family, and there is no concern here of any danger [in this case], and it would be even better [to completely remove any doubt of danger] to do this by hiring a non-Jew [for whom there is certainly no danger] to cut down the trees. Nevertheless, it is not permissible to cut down [fruit-producing] trees for the purpose of enlarging his apartment for [luxuries, such as] having more space for walking around or comfort or beauty.*

While the prohibition of *bal tashchit* is especially stringent in preventing the destruction of fruit-producing trees, where there is not a clear *need*, some Acharonim took this a step further. For example, R. Eliezer Papo (1785-1828) also applied *bal tashchit* to the indulgence in other non-necessities[167]:

> וכן אם הולך על גחון אחר מאכלים טובים ותאנוגות בני אדם ואחר מלבושים נאים ודירות נאות ועליות מרווחות ומצוירות ומכוירות, עובר על בל תשחית.

> *And similarly, if [a person] 'slithers on his belly' after fine foods and the delights of [wealthy] people and after beautiful clothes and beautiful houses and spacious, luxurious penthouses, he violates bal tashchit.*

R. Papo takes what seems to be an extreme position on the application of *bal tashchit* to non-necessities (see also section 3.2.2.4A). Nevertheless, this indicates that the range of application for the prohibition of *bal tashchit* can include even what might be considered common luxuries. It is important to note that the source of this quote, R. Papo's book, *Pele Yoetz*, is an *ethical* treatise, going at times beyond what would be considered normative halacha.

Moral-Ethical aspects of *bal tashchit* in the Acharonim

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[165] R. Yair Chaim Bachrach, *Chavot Yair*, (Jerusalem, 1992), Responsum 195, p.105a.
[166] R. Ovadyah Yosef, *Yabiah Omer* (Jerusalem,1986), vol. 5, Yoreh Deah 12, pp.195, 198.
[167] R. Eliezer Papo, *Pele Yoetz*, vol. 2 (Jerusalem, 2000), p.50.

R. Zvi Ashkenazi (1660-1718) writes that the purpose of *bal tashchit* is not to prevent destruction so much as to teach human beings sensitivity[168]. This is remarkable considering that many other Biblical commandments teach sensitivity towards other humans[169], or sensitivity to animals[170], and there wouldn't seem to be a need for such redundancy in the prohibition of *bal tashchit*. Apparently, Ashkenazi's emphasis here is to teach humans to be sensitive to the destruction of even inanimate objects.

Similarly, R. Samuel David Luzzato (1800-1865) writes[171]: *It [bal tashchit] was given to strengthen in our hearts compassion and graciousness and opposition to our own [selfish] purposes.*

R. Naphtali Hertz Kretchmer (early 20th century) writes[172]:

הטעם מובן כי אכזריות הוא להשחית עץ מעכל , ומזה יראו האומות, כי באמת ישראל רחמנים הם , ולא ישחיתו אף מין צמח, אם הוא נושא פירות.

> *The reason [for the prohibition of bal tashchit] is understood, since it is cruelty to destroy a fruit-producing tree, and from this [refraining from destroying it] the nations will see that in truth, the Jewish people are merciful, and they don't destroy even vegetation if it bears fruit.*

All of the above sources emphasize how the prohibition of *bal tashchit* is meant to help develop in adherents to Jewish law the traits of sensitivity, compassion and self control, and to demonstrate these traits to others.

R. Samson Raphael Hirsch, perhaps more than any of his predecessors, stressed the overall importance as well as the moral-ethical aspects of *bal tashchit* in the following lines[173]:

> *And from this [the prohibition of bal tashchit] you should hear the warning of G-d: "Do not corrupt or destroy anything" and apply it to your whole life and to every being which is subordinated to you, from the earth which bears them all to the garment which you have already transformed into your cover.*
>
> *Do not corrupt or destroy anything is the first and most general call of The Creator, which comes to you, Man, when you realize yourself as master of the earth. All round you, you perceive earth and plant and animal, already bearing your imprint from your technical human skill. They have been transformed by your human hand for your human purposes, into dwelling-place and clothing, food and instruments, and you have taken them as your property….Only if you use the things around you for wise human purposes, sanctified by the word of My Torah, only then are you a Man and have the right over them which I have given you as a Man. However, if you use them unwisely, be it the*

[168]R. Tzvi Ashkenazi, *Chacham Tzvi*,(Jerusalem 1994), responsum 26, p.35.
[169]For example, the commandments to 'love your neighbor as yourself', to refrain from hurtful speech, to visit the ill, and to give assistance to the poor.
[170]For example, the prohibition against causing unnecessary suffering to animals (tza'ar ba'ale chayim).
[171] Cited in: David Novak, *Jewish Social Ethics,* (New York, 1992), p. 122-123.
[172] Naphtali Hertz Kretchmer, *Noam haMitzvot* (Piotrkow, 1912, reprinted Jerusalem,1974), commandment 529, sect. 5, p.31.
[173]R. Samson Raphael Hirsch, *Horeb, a Philosophy of Jewish Laws and* Observances, trans. I Grunfeld (New York, 1980), ch. 56, pp.279-280.

> *greatest or the smallest, you commit treachery against My world, you commit murder and robbery against My property, you sin against Me!*
>
> *Therefore the sages say, he who in his wrath tears his clothes, breaks his vessels to pieces, or scatters his money, should in your eyes be as one who has worshipped idols… And in truth, there is no one nearer to idolatry than he who can disregard the fact that things are property of The Creator, and who presumes also to have the right, since he has the might, to destroy them according to his presumptuous will. He is already serving the most powerful idol in his inward self- anger, pride, above all his ego, which in its passion regards itself as the master of all things.*

In these words, which are stunning in their intensity even for R. Hirsch, one hears the moral-ethical side of *bal tashchit* expressed in the strongest possible language, as: *the first and most general call of The Creator, which comes to you, Man.*

R. Hirsch likewise writes, in his commentary on the Torah (on Deuteronomy 20:20)[174]:

> *But the prohibition of purposeless destruction of fruit trees around a besieged city is only to be taken as an example of general wastefulness. Under the concept of bal tashchit the purposeless destruction of anything at all is taken to be forbidden, so that the lo tashchit [don't destroy] of our text becomes the most comprehensive warning to human beings not to misuse the position which The Creator has given them as masters of the world and its matter to capricious, passionate, or merely thoughtless wasteful destruction of anything on earth. Only for wise use has The Creator laid the world at our feet when He said to Man "subdue the world and have dominion over it".*

A remarkable story is told of R. Avraham Yitzchak Kook (1865-1935), the first Ashkenazi Chief Rabbi of Mandatory Palestine, to illustrate his sensitivity to unnecessary destruction. While walking with Rabbi Kook in the fields of Jaffa, Israel, a companion absent-mindedly picked a flower. Rabbi Kook was visibly shocked, and said: *My whole life I have been careful not to pick grass or a flower which could have grown more*[175]. A similar story is told about R. Menachem Mendel Schneerson (1902 -1994), the late leader of the Chabad Chassidim who, upon seeing someone mindlessly pluck a leaf from a tree commented: *How can a person be so light-minded in relation to a creature of the Almighty? This leaf is something created by the Almighty for a particular reason… One should always remember the mission and the Divine intention of every created thing.*[176]

[174]Hirsch, *Pentateuch*, vol. 5, p.395.
[175]R. Shear Yashuv Cohen, 'The Cutting of Trees in Times of Peace and War', *Techumim* 4 (1983), p.44. This story concerns an incident that took place between R. Aryeh Levin and R. Avraham Yitzchak Kook.
[176]R. Menachem Mendel Schneerson, *Likutei Dibburim* (New York, 1987), vol. 1, pp. 177-180.

3.1.6 A chronological overview of *bal tashchit*: conclusions and further comments

From the chronological overview it is evident that the conservation of the world's resources has long been an important value in Jewish tradition, and is expressed in religious-legal terms in the prohibition of *bal tashchit*. The oral law (in what I am calling the *Talmudic* era) interprets the prohibition of destroying fruit-producing trees to include everything physical from which man can benefit. This is expressed, in the Talmud, in a wide range of examples ranging from the protection of human life and health, to other animate and inanimate objects. The coverage includes economic as well as moral-ethical considerations. This framework of coverage is carried through and has further developed in subsequent Jewish textual sources.

Anthropological perspective on *bal tashchit*

For most of human history, up until the past century, material resources were severely limited for the vast majority of the population, Jewish and non-Jewish alike. Because of this lack of available and affordable material resources, conservation of these resources was the accepted norm and may have made most applications of *bal tashchit* appear superfluous[177]. The near-omission of the prohibition of *bal tashchit* in the *Shulchan Aruch* (as discussed in section 3.1.5 above) may have been due to this situation, where it was obvious that resources should not be wasted. According to R. Zev Smith, a contemporary Rabbinic leader in the United States[178]: *In the old days people didn't waste and didn't throw out good things, so bal tashchit was an [relatively] unheard of halacha. Therefore, there is little discussion of bal tashchit in Jewish legal books*. This is drastically different from the current situation in much of the developed world, and to an increasing case, parts of the developing world as well - where abundant and affordable material resources are taken for granted. Indeed, at least three books focusing specifically on the halachic (legal) aspects of *bal tashchit* have been published since the year 2000[179]. In the course of my research, I have been unable to find any other books dedicated solely to the subject of *bal tashchit*.

Two aspects of Torah – practical and ethical

The chronological overview reflects two aspects of the prohibition of *bal tashchit* – a practical side which is concerned with the negative effects of the destructive act on man's physical resources, and a moral-ethical side which is also concerned with the negative effects of acting in a wasteful or destructive manner on the individual and society. This reflects two complementary aspects of the Torah itself, which are known as *halacha* (the legal aspects - the 'letter of the law') and *aggada* (the 'spirit of the law') [180]. As contemporary scholar, R. Yehuda Levi explains[181]: *Contrary to popular belief, halacha does not necessarily spell out all details of all mitzvot. Some*

[177] A similar idea can be found in modern day Jewish life in the land of Israel. There are many aspects of Jewish law that are particular to the land of Israel and many of these were under-represented in the codifications of Jewish law written during the exile in foreign lands where these laws did not apply. An example is the body of agricultural laws applying to the observation of the Sabbatical year, which apply only in the land of Israel.

[178] From a taped lecture on the prohibition of bal tashchit by R. Zev Smith of the Beit Medrash Karlin Stolin, (New York, Sept 1997), by Irgun Shiurei Torah.

[179] These books are: R. Moshe Yitzchak Vorhand, *Birchat Hashem* (Jerusalem, 2000), R. Yitzchak Eliyahu Shtasman, *Aitz Hasadeh* (Jerusalem 2000) and R. Siman Tov ben Dovid Dovid, *Al Pachim Ketanim[On Small Containers]* (Tel Aviv, 2001).

[180] These two aspects of the Torah are described by R. Yehudah (Leo) Levi in: *Torah Study – A Survey of Classic Sources on Timely Issues* (Jerusalem, 1990), part 2, pp. 66-72.

[181] Ibid, p.68.

mitzvot are explicitly detailed, whereas others are left to the individual's own judgment, based on his best understanding and guided by Torah scholars. Concerning these latter mitzvot, the Torah provided us with general principles and examples alone; these are to be found in its aggadic parts. In other words, many aspects of Torah observance are not clearly defined by *halacha*, but rather, by guiding principles. We can use some of the (what I have called in the previous section) *moral-ethical aspects* of *bal tashchit* to help clarify a principle of *bal tashchit* which would have far broader implications than the prohibition itself.

Both R. Hirsch and the author of the *Sefer haChinuch* placed great emphasis on the moral-ethical rationale for *bal tashchit*. I can speculate that one of the reasons for this emphasis was that they were writing for co-religionists who were being strongly influenced by the non-Jewish culture of their surroundings. Both R. Hirsch and the author of the *Sefer haChinuch* lived in situations where the dominant non-Jewish society had opened up to the Jews. Many Jews were attracted to the philosophies and culture of the non-Jewish majority. Jewish leaders were pressed to confront the philosophical challenges of the non-Jewish world with discourses on the beauty and ethics of Judaism that would appeal, in particular, to the idealism of Jewish youth, who were the most vulnerable to assimilation. The writings of Rabbis such as R. Hirsch and the author of the *Sefer haChinuch*, therefore, appeal to the 'softer', ethical side of the issues rather than the harder, legalistic side so commonly used for those already committed to living according to Jewish law.

3.2 Legal framework of the prohibition of *bal tashchit*

A further step in understanding *bal tashchit* is to clarify a legal framework, based on Jewish tradition, including the textual sources brought in the chronological overview described above. This framework is presented below, first in a general sense, and then in more specific detail along with additional sources.

3.2.1 General legal framework of *bal tashchit*:

3.2.1.1 The prohibition of *bal tashchit* is obligatory upon all Jewish people at all times and in all places

3.2.1.2 It is forbidden (see 3.2.1.5 for exceptions) to destroy a fruit-producing tree. One who destroys a fruit-producing tree, either directly or indirectly, violates a negative commandment (and according to some opinions, an additional positive commandment, or possibly even two negative and one positive commandments[182]) of the Torah.

3.2.1.3 Aside from the legal prohibition of bal tashchit, there are other, 'metaphysical' warnings against destroying fruit-producing trees. These include an element of mortal danger to one who destroys a fruit-producing tree.

3.2.1.4 It is forbidden (see 3.2.1.5 for exceptions) to destroy or permanently damage, directly or indirectly, any object which may be of benefit to humans. This includes using the object improperly or inefficiently, in a way that permanently damages or destroys the object. There is disagreement as to whether this prohibition has the same level of stringency as the prohibition of destroying fruit-producing trees (Torah law) or a lesser level of stringency (Rabbinic law[183]).

3.2.1.5 *Exceptions* - it is permitted to destroy a fruit-producing tree or other useful object under the following circumstances:

A. For the purpose of preserving human life, health, and dignity

B. For the purpose of fulfilling a Torah commandment.

C. If there will be more benefit from the destruction of the tree or object than from its preservation. For example, if the wood of the tree is more valuable than the fruits it produces, or if the location where the tree is growing is needed for a more important purpose.

D. If the tree or object is damaging others or the property of others.

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[182] See section 3.2.2.2 for more discussion on these opinions.

[183] Torah law is defined as law that is derived directly from the Biblical sources. Rabbinic law is law that was instituted at a later time by Rabbinic authorities, which in certain circumstances, is less binding than Torah law. The difference between these is further discussed in section 3.2.2.4.G.

E. In all of the above cases, if there is a feasible alternative to destroying the fruit-producing tree or other object - for example, if a non fruit-producing tree, or another object of lesser value can be used instead, or if the fruit-producing tree can be uprooted and planted in another location rather than be destroyed – then one is obligated to choose the alternative and not destroy the tree or object.

3.2.2 Detailed legal framework of *bal tashchit*

The general framework listed above is helpful in understanding *bal tashchit*, but the application to many cases requires far more specificity.

3.2.2.1 The prohibition of *bal tashchit* is obligatory upon all Jewish people at all times and in all places[184].

The *Torah*, which Jewish traditions asserts was given to the Jewish people as instructions for living in this world, is obligatory upon each Jew. While the legal prohibition of *bal tashchit* is only obligatory upon the Jewish people, a *principle* of *bal tashchit* (which will be elucidated in the following chapters) may be of broader interest. Several other 'universal' Jewish principles, such as 'Love your neighbor as yourself', human dignity (see section 5.2.3) and the Sabbath could serve as precedents for this.

3.2.2.2 It is forbidden to destroy a fruit-producing tree. One who destroys a fruit-producing tree, either directly or indirectly, violates a negative commandment (and according to some opinions, a positive commandment or possibly even two negative and one positive commandments) of the Torah[185].

The Torah specifically forbids destroying a *fruit-producing tree*[186]. The legal authorities define a 'fruit-producing tree' as one of the species that produces at least a minimum quantity of fruit[187] that is known to be edible for humans, or a growing tree of these species that can be expected to produce at least the minimum quantity of edible fruit in the future[188]. Trees that produce non-fruit organs that are used for human consumption – for example leaves or bark that are used for teas, spices or medicinal products – are not, strictly speaking, considered *fruit-producing* trees[189].

The general prohibition of *bal tashchit* applies to the *direct* destruction of fruit-producing trees. According to Maimonides, this prohibition extends to the *indirect* destruction of fruit-producing trees (see section 3.1.3 above).

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[184] *Sefer HaChinuch*, commandment 529; Vorhand, pp. 3-5.
[185] Maimonides, *Mishneh Torah*, Laws of Kings, 6:8, vol. 12, p.263.
[186] Deuteronomy 20:19.
[187] The quantity given is one kab (approximately 2.2 liters) for dates and one quarter kab for olives (B.T. Baba Kama 91b). The definition of fruit follows the botanical classification, as the reproductive parts of the tree.
[188] Vorhand, p. 32-34; Shtasman, p. 24-25.
[189] Vorhand, p. 36.

According to the Sifrei[190], a classical halachic interpretation of the Torah predating the Talmudic period, there is an additional, non-obligatory positive commandment to eat the fruits of fruit-producing trees. Destroying a fruit-producing tree also nullifies the opportunity to fulfill this commandment: *For thou mayst eat of them' – this is a positive commandment, and 'thou shalt not cut them down' – this is a negative commandment.*

According to the Midrash Tenaim[191], one who destroys a fruit-producing tree violates two negative and one positive commandment: *not to destroy the tree* (for example by removing its water supply), *to eat from its fruits*, and *not to cut down the tree*.

It is important to note that in cases of doubt whether a tree is 'fruit-producing' or not, the Torah commands that the tree be preserved. This is based on the Torah verse[192]: *only the tree* that you know *is not food-producing may you destroy*. Therefore, before a tree can be destroyed, it must be clearly established that it is not a fruit-producing tree. One might suggest that this is similar to the '*precautionary principle*' which has become popular in the European Union over the past decade or so, and which states that "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation[193]".

3.2.2.3 Aside from the legal prohibition of *bal tashchit*, there are other, 'metaphysical' warnings against destroying fruit-producing trees. These include an element of mortal danger to one who destroys a fruit-producing tree.

The Jewish sources discuss metaphysical negative consequences that can occur when fruit-producing trees are destroyed. These consequences can be divided into three categories:

A. Effects on supernal (non-earthly) realms when a fruit-producing tree is destroyed:

> בשעה שכורתין את האילן שהוא עושה פרי הקול יוצא מסוף העולם ועד סופו ואין הקול נשמע (פרקי דרבי אליעזר (היגר) "חורב" פרק לג)
>
> *…When a fruit-producing tree is cut down, its voice (scream) goes out from one end of the world to the other, but is not heard…*[194]
>
> ובשביל ארבעה דברים מאורות לוקין: על כותבי (פלסתר) מסורת הש"ס: [פלסטר] ועל מעידי עדות שקר, ועל מגדלי בהמה דקה בארץ ישראל, ועל קוצצי אילנות טובות. (תלמוד בבלי מסכת סוכה דף כט עמוד א)
>
> *The luminaries [moon and sun] are stricken … because of those who cut down good trees*[195].

R. Menachem Recanati (1223-1290) writes[196]:

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[190] *Sifrei on the book of Deuteronomy*, ed. Eliezer Arieh Finkelstein (New York and Jerusalem, 1993), p. 239 (piska 203).
[191] *Midrash Tenaim on the book of Deuteronomy*, ed. David Tzvi Hoffman (Berlin, 1908-9), p.122, Deut. 20:19).
[192] Deuteronomy 20:20 רק עץ **אשר תדע** כי לא עץ מאכל הוא אותו תשחית
[193] EU 2000c Communication from the Commission on the Precautionary Principle. COM (2000) 1.2/2/2000. Available at http://eruopa.eu.int/comm/off/com/health_consumer/precaution_en.pdf.
[194] *Pirkei d'Rabbi Eliezer*, ed. Avraham Aharon Broda (Jerusalem, 1973), ch. 34, p.121.
[195] B.T. Succot 29a.
[196] Menachem Recanati, *Peirush al haTorah* (Rechovot, 2003), vol.2, pp.67-68.

והנה בהשחיתו למטה פוגם למעלה, אמנם אם אינו טוען פירות כבר פסק כחו, והבן מאמר רבותינו ז"ל [ב"ק צא ע"ב] לא שכיב שכבת ברי אלא דקץ תאינתא בלא זמניה , וזהו כי האדם עץ השדה כפשוטו , ואמרו רז"ל בפרקי רבי אליעזר [פכ"א] בשעה שכורתין עץ אילן שעושה פרי , הקול יוצא מסוף העולם ועד סופו ואין הקול נשמע , וכן בשעה שהנפש יוצאה מן הגוף. (ריקאנטי דברים פרק כ פסוק ה)

One who destroys [a fruit-producing tree] in the lower world [on earth] damages the upper worlds, but if it [the tree] doesn't produce fruit, its power [of the spiritual entity connected to the tree in the upper world] has already ceased. Recanati also connects the destruction of a human below in this world to the destruction of a fruit-producing tree, and writes[197]*: and this is the simple meaning of 'a man is a tree of the field'.*

The potential consequences of these influences are not clearly explained, although there is a clear implication that these are negative for mankind. The description of a scream going out from one end of the world to the other seems to indicate that what was considered in the 'upper worlds' to be a tragedy took place, whether or not it was recognized as such in the lower world. Perhaps the striking of the luminaries adds to the 'darkness' of the world. The medieval commentator, *Rashi*, explains that even when a person cuts down his own good trees, the 'luminaries are struck', because [through the action of cutting down good trees – which provide benefit to man and the world] he appears to be rebelling against the Creator and His blessings that bestow good on the world.[198]

B. Lack of success for those who cut down fruit-producing trees:

תנו רבנן: תגרי סימטא, ומגדלי בהמה דקה , וקוצצי אילנות טובות , ונותנין עיניהן בחלק יפה - אינו רואה סימן ב רכה לעולם. (תלמוד בבלי מסכת פסחים דף נ עמוד ב)

...A person who cuts down good trees will never see a sign of blessing[199]

A person will never profit from cutting down a good tree – apparently, even if he expects to use the wood or the location for a more important purpose. It is interesting to note that this source does not specify 'fruit-producing' trees, but rather 'good trees', which are not clearly defined.

C. Mortal danger incurred to one who destroys fruit-producing trees:

As discussed above in section 3.1.2, the Talmud attributes the premature death of Shivchat, the son of Rabbi Chanina to "cutting down a fig tree before its time". Many sages took this danger very seriously, citing the Jewish legal principle: *[We are obligated to be] more stringent with a danger than with a [Torah] prohibition*[200].

There is disagreement as to whether the mortal danger from destroying a productive fruit-producing tree exists independently of the prohibition of *bal tashchit*. For example, R. Ovadia Yosef (b. 1921) writes that if there is no prohibition of *bal tashchit*, then there is no danger, for one is dependent on the other. He brings prominent *Rishonim* and *Acharonim*, such as Maimonides, Rabbeinu Asher (the "Rosh") and R. David Halevi Segal (the "Taz") as a proof,

[197] Ibid.
[198] B.T. Succot 29a: commentary of Rashi.
[199] B.T. Pesachim 50b; Tosefta Bikurim 2:15.
[200] B.T. Chullin 10a (חמירא סכנתא מאיסורא).

since they make no mention of mortal danger when discussing situations where destroying food producing trees is permitted[201]. On the other hand, some rule that the two (the prohibition and the danger) operate independently [202]. Therefore, even in cases where it is legally permitted to cut down the tree – for example, if the wood of the tree is more valuable than the fruits, or if the landowner needs the site where the tree is growing for a more important purpose – the danger remains. The concern over the danger in cutting down a food producing tree was sufficient to prevent some legal authorities from permitting cutting them down even where it was legally justified[203]. As with the prohibition of *bal tashchit*, the danger of cutting down a productive fruit-producing tree apparently applies only to Jews[204].

3.2.2.4 It is prohibited to destroy or permanently damage, directly or indirectly, any object which may be of benefit to humans. This includes using the object improperly or inefficiently, in a way that permanently damages or destroys the object. There is a disagreement amongst the Rabbis as to whether this prohibition has the same level of stringency as the prohibition of destroying fruit-producing trees (Torah law) or a lesser level of stringency (Rabbinic law).

The condition '*may be of benefit'* requires further clarification. One could argue that virtually everything in nature is of at least potential benefit to humans, and therefore may be included within the prohibition of *bal tashchit*. Indeed, a number of Jewish sources state that everything in the world exists for man's benefit. For example, according to the Talmud[205]:

אמר רב יהודה אמר רב כל מה שברא הקדוש ברוך הוא בעולמו לא ברא דבר אחד לבטלה ברא שבלול לכתית ברא זבוב לצירעה יתוש לנחש ונחש לחפפית וסממית לעקרב... (תלמוד בבלי מסכת שבת דף עז/ב)

Rav Yehuda said, of everything that the Holy One created in His world, He did not create anything in vain. He created the snail [as a cure] for scabs, the fly [as an antidote] for hornet stings, the mosquito [as an antidote] for snakebite, snakes [as a cure] for sores, and spiders [as an antidote for the stings of] scorpions.

The Midrash brings a similar statement, as follows[206]:

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[201] R. Ovadiah Yosef, *Yabiah Omer* (Jerusalem,1986), vol. 5, Yoreh Deah 12, pp. 195, 198.

[202] R. Yaakov Emden, *Sha'alot UTeshuvot Sheilat Ya'abetz* (New York,1976), 1:76, p. 49a; R. Moshe Sofer, Sefer Chatam Sofer (Pressburg, 1864), vol. 1, Yoreh Deah responsum 102, p. 34b; R. Shalom Mordechai HaCohen Shvadron, *Sha'alot UTeshuvot Maharsham,* ed. Shalom Mordechai HaCohen Shvadron (grandson) (Jerusalem, 1992) 1:22, pp. 40-41, R. Shalom Mordechai HaCohen Shvadron, *Sha'alot UTeshuvot Maharsham*, ed. Shalom Mordechai HaCohen Shvadron (grandson) (Jerusalem, 1974), 7:178, p.162; R. Chaim Elazar Spira, *Minchat Elazar* (Bratislava, 1922, reprinted New York 2001) 3:13, pp.9b-10a; Yabiah Omer, citing Levushai Mordechai]; R. Yoel Teitelbaum, *Sha'alot UTeshuvot Divrei Yoel* 1:92:9, p.319.

[203] For example, see Responsa Minchat Eliezer 3:13, who did not want to permit cutting down a food producing tree for the sake of building a home because of his concern over the [possible] danger.

[204] There is, however, a Chassidic story about a non-Jew who, having suffered the premature death of nine of his sons, asked a Chassidic Rebbe for a blessing that his tenth son should be spared from the same fate. The Rebbe attributed the premature deaths of the other sons to their cutting down fruit trees that were growing in the man's courtyard. (See Mordechai Gerlitz, *Aspaklaria Hameirah*, episodes in the life of R. Meir of Premishlan (B'nei Braq, 1997), vol. 2, p. 350).

[205] B.T. Shabbot 77b.

[206] Exodus Rabbah (Jerusalem, 2001), vol. 3, sect. 10:1, p. 125.

אפילו דברים שאתה רואה אותן כאלו הם מיותרין בעולם כגון זבובים ופרעושים ויתושין הן היו בכלל ברייתו של עולם שנאמר (בראשית א) וירא אלקים את כל אשר עשה, והנה טוב מאוד (שמות רבה (וילנא) פרשה י)

Even things you see as superfluous in this world – like flies, fleas, and mosquitos – they are part of the greater scheme of the creation of the world, as it says [Genesis 1:31] "And the Creator saw all that He had created, and behold it was very good"...

The Rishonim were more explicit in declaring that everything was created for the benefit of man. For example, Nachmanides writes[207]:

כי השם ברא כל הנבראים התחתוני ם לצורך האדם כי הוא לבדו בהם מכיר את בוראו (רמב"ן ויקרא פרק יז פסוק יא)

The Creator created all of the creation below for the needs of Man, because he alone amongst them recognizes his Creator.

Similarly, Maimonides writes[208]:

אך כלל הדברים כל הנמצאים תחת גלגל הירח לא נמצאו אלא בשביל האדם בלבד, כל בעלי החיים מהם למזונו כגון הצאן והבקר וזולתם, ומהם לתועלת אחרת כגון החמור להעביר עליו מה שלא יוכל להעבירו בידו, והסוסים לעבור בהם דרך רחוקה בזמן קצר . ומהם מינים שאין אנו יודעים תועלתם ויש בהם תועלת לאדם שאינו יודע אותה. וכך הפירות מהם למזונו ומהם לרפא תחלואיו , וכך העשבים, וכך כל המינים . וכל מה שתמצא מבעלי החיים והצמחים שאין בו תועלת ואינו מזין לפי דעתך הרי זה מחוסר ידיעתינו, ומוכרח שיש לכל עשב ולכל פרי ולכל מיני בעלי החיים מהפיל עד התולעת איזו תועלת לאדם , והראיה לזה שבכל דור ודור מתגלים תועליות עשבים ומיני פירות מה שאל נתגלה למי שהיה קודם , ומפיקים מהם תועליות רבות , ואין ביכולת אדם להקיף תועליות כלל צמחי הארץ, אבל הדבר מתגלה על ידי הנסיונות במשך הדורות. (הקדמת הרמב"ם למשנה ד"ה דע שהקדמונים)

In general, all of the creation under the sphere of the moon exists only for the sake of Man. All animals, amongst them for food, such as sheep and cattle and others, and for other purposes such as the donkey to carry what man can't carry himself, and the horse to travel far in a short time. And amongst them species that we don't know their purpose, which serve an unknown purpose for man. And so with the fruits, some for food, some for healing illnesses, and so for the herbs, and so for all species. And all animals and plants that don't seem to have a purpose and aren't edible according to your knowledge, behold this is from our lack of knowledge. Every herb and all fruits and all species of animals from the elephant to the worm definitely serve some purpose for man, and the proof for this is that in every generation new benefits from herbs and types of fruits are discovered that weren't known earlier, and many benefits are derived from them, and [while] it's not in man's capability [presently] to derive the benefits from everything that grows, but it will be revealed through experimentation as the generations pass.

Maimonides' remarkable statement has far-reaching consequences. He clearly expresses that it is only man's ignorance that prevents him from recognizing the benefits available from every aspect of the creation. He further states an important principle that with the passage of time man will

[207]Nachmanides, vol. 2, p. 97.

[208]Maimonides, *Introductions to the Commentary on the Mishnah*, ed. Mordechai Dov Rabinovitch (Jerusalem, 1961), p. 74. This concept can also be found in an earlier Talmudic statement (B.T. Brachot 6b): *"For this is all of man" (Ecclesiastes 12:13) "R. Elazar commented that the Creator is saying: all the world was created only for this [the man who obeys the Creator]*.

increase his knowledge and come to recognize the benefits from species that don't appear to be of any use to man in the present time. This implies that the scope of objects covered by the prohibition of *bal tashchit* will increase over time as human knowledge increases, to the point where it may encompass everything on the planet. Put differently, the implication of Maimonides' words seems to be that in truth everything on earth *should* be included within the prohibition of *bal tashchit* even now, since the objective reality is that everything does provide at least *potential* benefit to man, even though this may only be realized at some point in the future.

Interestingly, the principle that everything was created for the sake of man seems to contradict another statement by Maimonides[209]:

> הדעת האמתית אצלי לפי האמונות התוריות והנאות לדעות העיוניות, הוא שלא נאמין בנמצאות כולם שהם מפני מציאות האדם, אבל יהיו ג"כ שאר הנמצאות כולם מכוונות לעצמן לא מפני דבר אחר (ספר מורה הנבוכים חלק שלישי פרק יג)

> *The truth, it seems to me,… is that we shouldn't believe that all beings exist for the sake of Man, but rather that the other beings also have been intended for their own sakes, and not for the sake of something else.*

Contemporary scholar, R. Menachem Slae attempts to resolve this apparent contradiction by explaining that in the first statement, Maimonides is referring to all of the earthly world (under the sphere of the moon) – which exists for the purpose of man, and in the latter statement, Maimonides is referring to the "מלאכים" (spiritual beings) and the heavenly bodies (stars and planets), which are also part of the creation, but which are above the sphere of the moon and which also exist for purposes independent of man[210].

It is important to clarify that our primary concern is whether everything on earth is intended for man's *benefit*, and therefore included in the prohibition of *bal tashchit* (which prohibits needlessly destroying anything that man can *benefit* from). The sources listed above clearly indicate that Jewish tradition considers everything within the earth's ecosystem to be created for the *benefit* of man. This does not equate with saying that everything was created *only for the sake of* man. Along these lines, R. Hirsch expresses the creation as a holistic system of mutual interdependence, wherein everything exists for the benefit of man, but also for its own sake, and for the benefit of the whole system[211]:

> *He [the Creator], in His infinite wisdom, ordained this mutual interdependence in order that each individual being might contribute, whether much or little, to the preservation of the All… One glorious chain of love, of giving and receiving, unites all living things. All things exist in continuous reciprocal activity – one for All, All for one. None has power, or means, for itself; each receives only in order to give, and gives in order to receive, and finds therein the fulfillment of the purpose of its existence.*

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[209] Maimonides, *Moreh Nevuchim* (Guide for the Perplexed) trans. Shmuel Ibn Tibbon, ed. Yehudah Ibn Shmuel (Jerusalem, 2000), sect. 3, ch. 13, p.409.

[210] R. Menachem Slae, *Chaito Aretz, on Nature and the Unity of the place of Animals in the Jewish sources* (Jerusalem, 1988), p.21.

[211] R. Samson Raphael Hirsch, *The Nineteen Letters on Judaism*, ed. Jacob Breuer (Jerusalem, 1969), p.36 (note, this quote is reproduced in its entirety in Appendix 1).

R. Vorhand writes that objects such as wild animals, or plants or trees that nobody is likely to benefit from may be destroyed without concern of violating the prohibition of *bal tashchit*[212]. This seems to contradict the principle discussed above that everything in nature was created for the benefit of man. One possible response to this contradiction is to separate the overall *principle* of *bal tashchit* from the actual *legal prohibition* – for which a violator can be liable to court-administered punishment. The *principle* of *bal tashchit* prohibits the *needless* destruction of any created object – since the natural world was ultimately created for the benefit of man. Nevertheless, a *legal prohibition* can only operate within clear delineations. If there is not likely to be any tangible benefit to humans from a specific object, such as a wild animal in a distant forest, then the object is not protected by the legal prohibition.

Objects/resources that provide tangible benefit to man, and which *halacha* would therefore include in the prohibition of *bal tashchit* can be categorized as follows:

A. The life and health of the human body – Jewish tradition views the human body as a temporary 'vessel' for the soul[213] to enable the soul to exist in the physical world. The body can be considered a 'physical resource', which – like all other physical resources – ultimately belongs to the Creator, rather than to its temporary human possessor[214]. The life and health of the human body, therefore, is also subject to the prohibition of bal tashchit[215].

Unnecessarily causing *permanent* injury to the human body is clearly prohibited by *bal tashchit*[216]. There is disagreement as to whether causing *temporary* injury to the human body is considered *bal tashchit*, since the body can heal itself and return to its previous state, negating the damage. For example, the Talmudic sage Rav Hisda used to lift his garment when walking through thorns, preferring to suffer temporary scratches to his legs rather than to tear his garment. He justified this by stating that his body would heal itself, whereas his garment would not[217].

Protecting human life and health clearly takes precedence over the protection of other valuable resources. R. Eliezer Papo (1785-1828), author of *Pele Yoetz*, reinforces this view, writing that a person transgresses *bal tashchit* if he spends more money than necessary for food where the more expensive food is not more healthy for the body[218]. The implication is that where the more expensive food is healthier for the body, a person who can afford it should buy the healthier and more expensive food.

B. Animals – Unnecessarily killing or damaging any animal that may be of benefit to humans is a violation of bal tashchit[219].

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[212]Vorhand, pp.129-130. In his commentary, Vorhand brings a number of sources that seem to contradict this ruling, and offers suggestions as to how to resolve this contradiction.

[213] See for example *Sefer HaChinuch*, commandment 73 (*shorshei hamitzvah*), p. 32.

[214] See 3.1.4 above, where *Sha'arei Tshuva*, ch. 3:82, p.72 is cited*;* see also *Shulchan Aruch Harav*, sect. 6, *Hilchot Shmirat Hanefesh v'haguf v'bal tashchit* 14, p. 1775.

[215]Vorhand, p.138; Shtasman, 10:1, pp. 106-108.

[216] Shtasman, p. 106. There is disagreement on the permissibility of causing permanent damage to the body where there is a legitimate need. Maimonides (*Mishneh Torah*, ed. S. Frankel (Jerusalem and B'nei Braq, 1982), Laws of Injury and Damage 5:1, vol. 5, p.147 rules that this is also prohibited, whereas R. Jacob ben Asher, *Tur* (Tel Aviv, 1999), vol. 21, Choshen Mishpat vol. 8, sect. 420:31, p. 425, and others permit it.

[217]B.T. Baba Kama 91b; - it should be added that Rav Hisda was very poor and replacing or repairing the garment would have constituted a significant financial burden.

[218] Shtasman, p. 113.

[219]B.T. Chullin 7b.

R. Avraham Isaiah Karelitz (1878-1953), one of the leading halachic authorities of the twentieth century, writes that even those animals not normally considered beneficial to man contribute, at least subliminally, to mans existence[220]:

בעלי החיים משמשים את האדם , כמו שור לעול וחמור למשא , ומכינים מזון לאדם, חלב ובצים, ומהם שמכינים צמר ללבושו, ומהם שהם עצמם מאכל לבני אדם, ונבראו בסוגים שונים ובמינים רבים, ומזונותיהם שונים זה מזה: ומהם שאין בני אדם נהנין מהם כמו חיות טורפות ונחשים ושקצים ורמשים, ואמנם יש בהם צורך ותועליות נעלמות, ולפעמים האדם נענש על ידן , ולפעמים האדם לומד מהן חכמה ומוסר , וכבר הורגלנו במציאותן , ואנו נרגשים כי מבלעדם היה העולם חסר, ואין העולם יפה ושלם אלא כשחיות טורפות בו:

> *Animals are of utility to man, such as an ox for a yoke and a donkey for a burden, and they prepare food for man, milk and eggs, and from some of them we obtain wool to wear, and some of them are themselves food for people. They were created as different kinds and as many species, and the food of each is different. Some of them people do not benefit from, such as predatory animals, and snakes, and vermin, and insects; however they possess sublime necessity and benefit. Sometimes man is punished by way of them, and sometimes man learns wisdom and ethics from them. We are already used to their existence, and we feel that without them the world would be lacking, and the world is not beautiful and perfect except when there are predatory animals in it.*

From these words, it appears that according to some halachic authorities, all animals are of at least potential benefit to man. Therefore, intentionally killing or damaging any animal without *sufficient need* may violate the prohibition of *bal tashchit*. The determination of what constitutes sufficient need is the operative factor.

Animal Experimentation and Jewish law

One of the most common and controversial cases of deliberate human-induced killing or damaging of animals is animal experimentation. Is animal experimentation a violation of *bal tashchit*?

It would appear that if the animals in consideration are bred and raised strictly for the sake of experimentation (as is largely the case today), and would provide no other significant benefit for humans, this would not be a violation of the prohibition of *bal tashchit*. In all cases, as long as humans are likely to derive greater benefit from the results of the experimentation than would be derived from the animal otherwise, there would be no violation.

While on the topic of animal experimentation it is important to note that in addition to the prohibition of *bal tashchit*, there is a related[221] Biblical prohibition against causing unnecessary *suffering* to animals. This prohibition is known as *tza'ar ba'alei chayim* (צער בעלי חיים) or 'suffering of living beings'. The criteria for deciding whether animal experimentation is a violation of either *bal tashchit* or *tza'ar ba'alei chayim* are similar. For example, in determining the permissibility of

[220] R. Avraham Yeshaiah Karelitz, *Sefer Chazon Ish on matters of Faith and Trust etc.* (Tel Aviv, 1979), 1:7, p.10.

[221] I consider the prohibition of *tza'ar ba'alei chayim* to be related to the moral-ethical aspects of bal tashchit discussed at the end of sections 3.14 and 3.15. Both are concerned with developing within man a compassionate attitude towards other living beings.

animal experimentation – from the perspective of *tza'ar ba'alei chayim* – contemporary scholar R. Yitzchak Eshkoli divides the experimentation into the following categories[222]:

1. Where there is likely to be clear benefit in the form of a cure for a human ailment (even if not a fatal ailment).
2. Where there is doubt as to the results, but there may be a cure
3. Experimentation on non-essential food or cosmetics to determine their safety for humans.
4. Experiments that may lead to monetary profit.

These categories would apply equally to the prohibition of *bal tashchit*. To be permissible, the expected benefits from the experimentation must justify the destruction (*bal tashchit*) and the suffering (*tza'ar ba'alei chayim*) caused to the animals. In practice, the decisors appear to have been lenient (towards the experimenters) in their decisions. For example, when asked about the permissibility of performing medical experiments on 'impure'[223] animals, when the experiments may cause the death of the animals, R. Yaakov Reicher (1670-1733) rules that wherever there is a need, or cure, or [even] monetary benefit there is no concern of violating the prohibitions of *bal tashchit* or *tza'ar ba'alei chayim*, and it is permitted even if there is a doubt as to whether any cure will come from it[224].

Likewise, R. Shtasman cites a number of legal decisors that rule that there is no concern of either *bal tashchit* or *tza'ar ba'alei chayim* if any human needs are involved, whether these be needs for healing the body or even for monetary gain[225].

R. Eshkoli summarizes the Jewish legal position on animal experimentation as follows: Even though there are legal decisors that express doubt as to the permissibility of performing medical experiments on animals where there is no clear benefit, nevertheless, a clear majority of legal decisors permit performing these experiments. Some of those that permit medical experimentation on animals even forbid being [overly] strict in accessing the necessity of the experiments since the experiments may be needed for the public good. In order to derive the maximum benefit and reduce as much as possible the suffering of the laboratory animals, R. Eshkoli recommends adhering to the following principles:

1. Clear determination should be made that the experiment is necessary and that it is not possible to rely on previous experiments.

2. Every effort should be made to minimize the suffering of the animals in every stage of the experimentation, including the raising and housing of the animals in sufficient space with pleasant food, and use of anesthesia and other pain-reducing methods, and to ensure that when the experiments are completed [if it is necessary to kill the animals] to kill them in the fastest, most painless way possible.

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[222] R. Yitzchak Nachman Eshkoli, *Tza'ar Ba'alei Chayim, the Prohibition against causing pain to Animals according to Jewish Halacha and Aggada* (Ofakim, 2002), p. 403.

[223] Jewish tradition (see for example, Leviticus Chapter 11) makes a distinction between ritually 'pure' and 'impure' animals. Ritually 'Pure' animals - such as cows, sheep and goats are the only kind permitted for Israelite consumption, and in Biblical times, for offerings to the Creator. In general, ritually 'pure' animals are considered of greater importance, in Jewish tradition, than those that are ritually 'impure'.

[224] R. Yaakov Reicher, *Sefer Shvut Yaakov* (Jerusalem, 1980), sect. 3, responsum 71, pp. 12a-b.

[225] Shtasman, p.104.

3. The experimentors should use the smallest number of animals possible that will enable them to reach the needed conclusions.

4. Wherever possible to use [non-animal] replacements instead of using the animals themselves, the replacements should be used.

5. Most legal decisors rule that the prohibition of causing unnecessary suffering doesn't apply to insects. Therefore wherever possible, experiments should be performed on insects instead of [higher] animals. Similarly, wherever possible, the experiments should be performed on fish rather than mammals and ritually 'impure' mammals (for example mice and rabbits) rather than ritually pure mammals (such as sheep, goats and cows)[226].

It would appear that all but the last recommendation would be consistent with any universal ethical guidelines for animal experimentation. For example, the *Declaration of Bologna* - which was adopted by the 3rd World Congress on Alternatives and Animal Use in the Life Sciences in 1999 concludes: *The only acceptable animal experiment is one which has been approved by an ethical review committee, uses the smallest possible number of animals, and causes the least possible suffering which is consistent with the achievement of its scientific purpose*. This declaration endorsed the "*Three R's*" (reduction, refinement, and replacement) originally put forward by Russell and Burch in 1959[227].

C. Vegetation – As already discussed, fruit-producing trees have a special status in regards to the prohibition of bal tashchit. All other forms of vegetation, including non fruit-producing trees, are included in the general prohibition against needlessly destroying anything of potential benefit to man.

D. Water – water has unique properties that make it a particularly interesting resource in regards to bal tashchit (as will be discussed in more detail in Chapter six).

First of all, water is virtually indestructible. Even when polluted or transformed from a liquid to a gaseous or solid state, the same water can be restored to its original state. Other resources, even if renewable, are far more difficult, if not impossible to restore to their original state once damaged.

Secondly, water is extremely abundant. Approximately 70% of the earth's surface is covered by water. While only a tiny fraction of the earth's total water supply is potable, and potable water is lacking in many areas, potable water can be produced, with the necessary resources, from less pure water.

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[226] Eshkoli, p. 408-409. It is important to note that in any case, the larger mammals such as cows, sheep and goats, or 'impure' mammals such as horses or camels are far too expensive for commercial experiments. A special breed of mini-pigs, which are ritually 'impure' animals are also currently used for some experimentation.

[227] W.M.S. Russell and R.L. Burch, *The Principles of Humane Experimental Technique*, as quoted in the Bologna Declaration. (Bologna, 1999). Russell and Birch define the "three R's" as: *reduction* alternatives as methods for obtaining comparable levels of information from the use of fewer animals in scientific procedures, or for obtaining more information form the same number of animals; *refinement* alternatives as methods which alleviate or minimize potential pain, suffering and distress, and which enhance animal well-being; and *replacement* alternatives as methods which permit a given purpose to be achieved without conducting experiments or other scientific procedures on animals.

Thirdly, water is an economic oddity. On the one hand, under normal circumstances water has little economic value. On the other hand, water is absolutely necessary for life and for most human activities. The Jerusalem Talmud expresses the economic peculiarity of water[228]:

> מים בזול ויין ביוקר איפשר לעולם לחיות בלא יין אי איפשר לעולם לחיות בלא מים . (תלמוד ירושלמי מסכת הוריות פרק ג דף מח טור ג /ה"ה)
>
> *Water is inexpensive and wine is expensive [and yet] it is possible for the world to live without wine; it is impossible for the world to live without water.*

Because water is inexpensive, there is a tendency to waste or otherwise misuse it. On the other hand, it is impossible to live without (reasonably pure) water whereas it is possible to live without many resources with a higher economic value such as wine.

It is interesting to note that economists such as John Law and Adam Smith later pointed out the same paradox, which became known in economic parlance as the 'paradox of value'. The classic example they used was the comparison of water and diamonds[229].

Finally, water is a multi-purpose resource with a wide variety of 'normal' or acceptable uses. For example, in a typical household, the normal usage of water coming from the same water line includes drinking, food preparation, cooking, bathing, washing dishes, laundering clothes, scrubbing floors, flushing toilets and watering plants.

Where there is a shortage of pure water and a practical choice of using either pure water or less pure water, it may be possible to limit the proper use for pure water to basic human necessities where pure water is required – such as drinking, food preparation and cooking. In such a case, using pure water for other applications – where less pure water would suffice – may constitute a violation of *bal tashchit*. This theme will be further developed in chapter six.

Given the unique properties of water listed above, there is some question as to whether the prohibition of *bal tashchit* applies directly to water itself, or to other resources that are expended in order to bring the water to a desired state. For example, wasting hot water may be a violation of *bal tashchit* because of wasting the fuel that was needlessly consumed to heat the water[230]. Similarly, needlessly polluting pure water may be a violation of *bal tashchit* because of the energy and other resources that are required to purify the water to its original and greater benefit-producing state, or to import higher quality water to replace the polluted water.

Some Rishonim, such as Rabbeinu Yerucham (1280-1350), rule that *bal tashchit* does apply directly to water. Based on the Talmudic dictum[231]: *A person should not dump out water from his cistern when others are in need [of the water]*, Rabbeinu Yerucham writes that a person who spills out water from his cistern when others are in need of water violates the prohibition of *bal*

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[228] J.T. Horayot, Chapter 3, halacha 5.

[229] See *John Law's 'Essay on a Land Bank,'* ed. Antoin E. Murphy, (1704, reprinted Dublin, 1994), p.57; and Adam Smith, *An Enquiry into the Nature and Causes of the Wealth of Nations*, ed. Edwin Cannan (1776, reprinted New York, c.1937), book 1, ch.4, note 84.

[230] Vorhand, p.134.

[231] B.T. Yebamot 44a .אמר רב יוסף, כאן שנה רבי: לא ישפוך אדם מי בורו ואחרים צריכים להם

tashchit[232]. R. Shtasman writes that [some of] the Acharonim considered water to be lacking any intrinsic monetary value, and therefore, to be excluded from the prohibition of *bal tashchit*[233].

Perhaps the deciding factor as to whether *bal tashchit* applies directly to water or not is whether there is a present need for the water. If there is a present need, as indicated in the ruling of Rabbeinu Yerucham, then wasting or needlessly polluting the water is a violation of *bal tashchit*. If there is no present need for the water, there may be no violation of *bal tashchit* on the water itself, but there may be on other resources if they were used to heat, purify or otherwise improve the water before it was wasted or polluted.

E. Food

The Jewish legal decisors placed great importance on not wasting food that is fit for human consumption. According to the Sifrei, conserving food fit for human consumption requires perhaps even greater stringency than preserving fruit-producing trees[234]:

כי האדם עץ השדה, מלמד שחייו של אדם אינם אלא מן האילן . רבי ישמעאל אומר מיכן חס המקום על פירות האילן קל וחומר מאילן ומה אילן שעושה פירות הזהירך הכתוב עליו פירות עצמם על אחת כמה וכמה. (ספרי דברים פיסקא רג)

For man [his sustenance] is a tree of the field – this teaches that man's life is dependent on trees. Rabbi Yishmael says, from here [we learn that] the Creator has concern for the fruits of trees – by inference from the tree. Just as scripture warns against [destroying] a fruit-producing tree, all the more so [is there a concern] about destroying the fruit itself.

The Sifrei here seems to contradict the idea that the constant producer of benefits is more important than any unit of the benefits themselves. I would suggest that it is the fruits themselves that provide immediate and tangible benefit to man, and were they to be destroyed, the production of the tree, in the immediate sense, would be in vain. In this respect, the fruits have greater immediate importance. Nevertheless, from a longer-term perspective, preventing the destruction of the tree is clearly more important.

It is forbidden to unnecessarily destroy any food that is potentially fit for human consumption, even if at the present time it is not ready or fit for consumption[235]. In fact, the protection of food is stricter than that for most other resources. Even those who rule that the prohibition of *bal tashchit* of other (non fruit-producing tree) resources is of Rabbinic origin agree that the prohibition of *bal tashchit* of food is of Biblical origin[236].

The additional prohibition of bizui ochlim *(disgracing food)*

In addition to prohibiting the unnecessary destruction of food fit for human consumption, the Jewish sources also proscribed actions that would 'disgrace' the food, or more accurately, 'disgrace' the Creator – its ultimate Provider – even if not causing any physical damage to the

[232] Rabbeinu Yerucham, *Sefer Toldot Adam V'Chava* (Tel Aviv, 1960), vol. 2, Netiv 31, sect. 6, p. 103. השופך מי בורו ואחרי' צריכין לו אסו' כך פשו' ביבמות מסתבר' דאי בעי למשפכינהו מעכבין עליה ויהבינ' להו בתר הכי משמתי' ליה משו' בל תשחית
[233] Shtasman, pp. 211, 212. For example, For example he adduces this from *Sha'alot UTeshuvot Maharsham,* (Jerusalem, 1992), 3:375, p.308.
[234] *Sifrei*, p. 239 (piska 203) (on Deut. 20:19-20).
[235] Vorhand, pp. 211-216.
[236] Ibid, p.217.

food. This additional prohibition, known as the prohibition of '*bizui ochlim*, is clearly of Rabbinic origin. R. Vorhand writes that the rationale for this prohibition is that one who 'disgraces' good food appears to be actively denying the good bestowed upon him by the ultimate source of the food – the Creator[237]. Whereas the prohibition of *bal tashchit* applies to all food potentially fit for human consumption, even if not fit at the present time, the prohibition of *bizui ochlim* only applies to food that is presently fit for human consumption[238].

Food for other forms of life, which is not fit for human consumption (such as fodder that can be fed to cattle) is in the same general category as other (non fruit-producing tree and non human-food) resources with regards to *bal tashchit*.

F. Other valuable resources

Fuel – Fossil fuels (i.e. oil, coal and natural gas) are non-renewable resources that humans can benefit from. Therefore, needlessly destroying or degrading these fuels, or the energy derived from them, would be a violation of *bal tashchit*. Needlessly destroying or degrading energy derived from renewable sources (i.e. hydroelectric, solar, and wind-derived power) can also involve a violation of *bal tashchit*. While these energy sources are constantly replenished, non-renewable resources are currently consumed to produce the equipment necessary to harness the energy and translate it into useable forms. For example, utilizing solar energy currently requires fossil fuel energy to produce and transport the components for the photovoltaic cells and solar collectors and these non-renewable materials wear down with use and have to be replaced.

Section 3.2.5 above brought a Talmudic ruling that inefficiently using fuel violates the prohibition of bal tashchit. It is interesting to note that one of the examples brought was the inefficient burning of lamp oil. This was most likely oil derived from a vegetative source (such as olive oil which was commonly burned in lamps during the Talmudic period), and which could arguably be considered a renewable energy source.

Minerals – Minerals are also a finite resource and wasting or needlessly destroying mineral resources, such as metals, which people can benefit from is prohibited by *bal tashchit*.

Time and Effort – The possible application of *bal tashchit* to time and effort is both interesting and challenging. Undeniably, time is a limited, non-renewable resource of great value. According to R. Shmuel Di Uzeida[239] (16th century): *There is no loss comparable in importance to the loss of time*.

It is interesting to note that R. Chaim Falaji (1788-1868) writes that one of the things that contributes to a long life is being very careful not to violate the prohibition of *bal tashchit*[240]. In effect he is saying that being careful not to needlessly destroy resources will make available to a person more of the resource of time.

Human effort also has value. If the value of the effort required to preserve an object exceeds the value of the object itself, then it is not considered a violation of *bal tashchit* to allow the object to

[237] Ibid, p. 221.
[238] Ibid, p. 234.
[239] Shmuel Di Uzeida, *Midrash Shmuel* (B'nei Braq, 1989), 5:23, p.428-429.
[240] R. Chaim Falaji, *Kol HaChayim*, ed. Y. Moshe Hillel (Jerusalem, 1986), sect. 6, pp. 106-107, no. 9.

be damaged or destroyed[241]. Similarly, according to R. Shimon Sofer (1850-1944), if it requires a bother and loss of time to exercise care not to destroy something of little value it is permissible to destroy the object since even a food producing tree can be cut down if its location is needed for another use of greater value[242].

Contemporary scholar, R. Yitzchak Zilberstein contrasts R. Sofer's ruling to a different case where a caterer throws away leftover food in order to avoid the bother of having to deal with the food more constructively, such as by repackaging it and transporting it to a soup kitchen. R. Zilberstein writes[243]:

אבל כאן, לא נחשבת טרחתו ואיבוד זמנו הנאה יותר, כי אדרבה הוא מטריח עצמו שלא לעשות איסור. ובזה עובד את הקב"ה, ולא מצינו בשום מקום דבל תשחית דזמנו עדיף מבל תשחית של חפציו, כי זה לא נחשב השחתת זמן.

> *But here, [in a case of caterers throwing out leftover food], [avoiding] the bother and loss of time are not considered extra benefit. Just the opposite – he is expending more energy in order not to violate a prohibition and in this way he is serving the Creator. We don't find anywhere that bal tashchit of time [saving time by destroying an object] is preferred to bal tashchit of an object.*

R. Zilberstein rules that we are not permitted to destroy something simply for the sake of convenience, for example, in order to avoid the bother involved in not damaging or destroying the object[244]. In the case of the caterer, the choice is either to repackage and save the food or throw it away, which would be an act of destroying something that others could potentially benefit from. The difference may be between passively allowing something of little value to be destroyed and actively destroying something of value. There would also seem to be a difference between whether a person has something else more important that now requires their time, or whether they don't have something more important that now requires their time, but they simply don't want to be bothered with the extra effort.

On a strictly legal level, the prohibition of *bal tashchit* only applies to material resources and not to something non-material such as time and effort. On a moral-ethical level, however, the *principle* of *bal tashchit* would certainly seem to apply, as R. Di Uzeida indicates above.

Money

According to R. Yonah Gerondi (13th century), a person who throws away money violates *bal tashchit*[245].

This can be understood in two different ways – either as physically destroying legal currency, and/or as frivolous spending. R. Vorhand writes that this statement is understood to apply to one who intentionally destroys actual currency, rather than one who spends frivolously[246].

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[241] Zilberstein, p.64.
[242] R. Shimon Sofer, *Sefer Hitorerut Tshuva* (Jerusalem, 1974), sect 2, responsum 183 (Choshen Mishpat), p.175.
[243] Zilberstein, p.64.
[244] Ibid.
[245] R. Yonah Gerondi, *Sha'arei Teshuva*, (Jerusalem, 1985) 3:82, p.151.
[246] Vorhand, pp.173-174.

On the other hand, R. Yosef Yuspa Hahn (17th century) cites R. Yeshaya Segal Horowitz (also known as the Shelah – 16th -17th century), who wrote in his will that a person who spends more money than required for his needs violates the prohibition of *bal tashchit*[247]. In addition, R. Yosef Caro (quoted above in section 3.1.4) clearly indicates that spending more community funds than necessary is a violation of *bal tashchit*[248].

G. Improper use of resources

Destruction for its own sake: The purpose behind an action can play a determining role in whether a given destructive action constitutes a violation of *bal tashchit* or not. Maimonides rules that any destruction of a useful object for its own sake (such as to relieve one's anger) is a violation of *bal tashchit*[249]. Likewise, R. Yosef Babad (19th century) writes that a person who wants to use something for the sake of destroying it, even if he feels a great need for this, violates *bal tashchit* because the Torah forbids destroying an object in an *intentionally destructive way*[250].

Destruction for the sake of luxuries: A luxury is something that is not objectively needed in order to maintain the life, health and wellbeing of man, but which does provide some less important benefit to the consumer. Differentiating between what constitutes a 'luxury' and what is a legitimate need is subjective and sometimes difficult. Nevertheless, the Jewish legal authorities did see the need to make some objective distinctions between the two. As we discussed above, in section 3.1.5, destroying or degrading a fruit-producing tree for the luxury of expanding ones house (for the sake of a more comfortable house, rather than for the sake of relieving overly crowded conditions) or to plant a decorative garden is proscribed by the prohibition of *bal tashchit*. The permissibility of destroying or degrading an object (other than a fruit-producing tree) which other humans can potentially benefit from, strictly for the sake of a luxury, is less clear. This appears to be related to the nature of the object (is it something that people need to fulfill basic needs, such as food or water?), the level of need that others have for the object (is there currently a shortage?), and the financial situation of the owner[251].

Is the prohibition against destroying useful resources other than fruit-producing trees of Biblical or Rabbinic origin?

Whereas the prohibition against the needless destruction of fruit-producing trees is clearly derived from the Torah (Deuteronomy 20:19-20), there is disagreement as to whether the prohibition against needless destruction of other objects is of Biblical or Rabbinical origin. In other words, there is disagreement over whether, in applying *bal tashchit* to other resources, the Rabbis were expressing what they understood to be the original but unwritten intention of the Biblical verses or were, on their own, broadening the application of bal tashchit beyond the original intention in the Hebrew Bible. Much of the controversy revolves around a ruling by Maimonides that one who intentionally destroys a fruit-producing tree without sufficient cause is subject to makkot (a severe but non-lethal court-administered punishment), whereas one who

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[247] R. Yosef Yuspa (Nordlingen) Hahn, *Sefer Yosef Ometz* (Frankfurt, 1928), halacha 121, p.27.
[248] R. Yosef Caro, *Sefer Avkat Rochel* (Leipzig, 1859, reprinted Jerusalem 1997), responsum 18, p.19, col. 2.
[249] Maimonides, *Mishneh Torah*, Laws of Kings 6:10, vol. 12, p. 263-264.
[249] Vorhand, pp.114-123.
[250] R. Yosef Babad, *Minchat Chinuch* (Jerusalem, 1991) vol. 3, pp.309-310.
[251] See the end of section 3.14 which discusses this point in more detail.

intentionally and needlessly destroys other useful objects is subject to a 'malkut mardut' (a less severe court-administered punishment)[252]. Since the 'malkut mardut' is normally a punishment for the violation of Rabbinically-derived prohibitions, some interpret Maimonides to be ruling that *bal tashchit* of objects other than fruit-producing trees is a Rabbinic prohibition. Nevertheless, the majority of the Rishonim rule that *bal tashchit* of other useful objects is of Biblical rather than Rabbinic origin[253].

Interestingly, a number of modern writers such as Nir and Schwartz claim that the application of *bal tashchit* to anything other than fruit-producing trees is of Rabbinic origin, without even mentioning the aforementioned disagreement[254]. For example, Nir writes: *The rabbis of the Talmudic Era broadened the ban on cutting down fruit-bearing trees during a time of war into a much more elaborate series of rules, applicable in peacetime as well as in war.*

The practical difference between whether *bal tashchit* is of Biblical or Rabbinic origin involves cases of doubt. There is a Jewish legal principle that in cases of doubt we rule to the stringent side with Biblical commandments and to the lenient side with Rabbinic commandments[255]. Therefore, if *bal tashchit* of other objects is Biblical, then a situation where an action may or may not cause needless destruction would require being stringent and refraining from the action. If the prohibition is Rabbinically derived, there is room to be lenient and allow the action. Along these lines, R. Vorhand interprets authorities from the Rishonim and Acharonim as ruling that the more severe Biblical prohibition applies to *needlessly* destroying useable objects, whereas the more lenient Rabbinic prohibition applies to destroying an object for a purpose, but for a purpose that may not justify the destruction[256].

3.2.2.5 Exceptions - It is legally permitted to destroy a fruit-producing tree or other object under the following circumstances:

A. For the purpose of preserving human life, health or dignity

Judaism considers human life to be priceless, and requires its adherents to make every effort – including, if necessary, to violate any commandments – in order to save a human life[257]. The only exceptions to this are the commandments against murder, adultery and idolatry[258]. Therefore, it is not only permitted, but obligatory to destroy a fruit-producing tree or any other object if this is needed in order to save a human life. Preserving human health, while of lesser importance, is also an obligation in Jewish law that proscribes the violation of *bal tashchit*.

That which a person needs in order to strengthen and heal his body, even if it requires the destruction of resources, is not considered *bal taschit*[259]. Therefore, one is permitted to spend extra money or other resources for healthier food, as this is considered a legitimate need. On the other hand, to spend more money purely for the sake of better taste, when the more expensive food is

[252] Maimonides, *Mishneh Torah*, Laws of Kings 6:8, 10, vol. 12, p.263-264.
[253] Vorhand, pp. 114-123; Shtasman, pp.1-5.
[254] David Nir, 'A Critical Examination of the Jewish Environmental Law of *Bal Taschchit – Do Not Destroy*', *Georgetown International Environmental Law Rev*iew, vol. 18, no. 2, Winter (2006), p.339; Eilon Schwartz, "Bal Tashchit: A Jewish Environmental Precept", in *Trees, Earth and Torah*, (Philadelphia, 1999), pp. 83.
[255] B.T. Beitza 3b.
[256] Vorhand, p. 197.
[257] B.T. Shabbot 132a, Yoma 85b. See also Shulhan Aruch, Orach Hayim vol. 2, 328.2, p.497.
[258] B.T. Sanhedrin 74a.
[259] Zilberstein, p.72.

not healthier, is closer to a violation of *bal tashchit*[260]. Eating or drinking excessively may be, according to some opinions, a double violation of *bal tashchit*, since the person is unnecessarily destroying both food (in excess of his needs) and his own body[261].

Preserving human dignity is also of major importance in Jewish tradition, which may justify the destruction of degradation of resources, as will be further elaborated in chapter five (section 5.2.3).

B. For the purpose of fulfilling a Torah commandment

While *bal tashchit* – at least concerning fruit-producing trees – is one of the Biblical commandments[262], it is not necessarily given preference over other Biblical commandments. From a Jewish perspective, material resources were created for human use, to enable man to serve his Creator by following His commandments. Therefore, consuming material resources for performing these commandments is considered using them according to their proper purpose and not a violation of *bal tashchit*.

R. Vorhand writes that it is permissible to destroy an object for the sake of performing a Biblical commandment, and even a Rabbinic commandment, if it is impossible to fulfill the commandment without destroying the object[263]. In cases of doubt, where there is uncertainty as to whether the action will constitute performing a commandment or not, R. Vorhand permits destroying an object for a Biblical commandment but not for a Rabbinic commandment[264].

Enhancements and stringencies

Some authorities consider it permissible to destroy an object even for the sake of performing a commandment in a more enhanced and beautiful fashion[265]. For example, R. Vorhand cites the permissibility of replacing ritually acceptable fringes on the corners of a garment (tzitzit) with newer and more beautiful ones, even though this means discarding the older ones[266]

On the other hand, some rule that it is forbidden to waste or destroy an object for the sake of being more stringent than necessary in the performance of a commandment. For example, R. Menachem Azariah (1548-1620) writes that a person is not allowed to violate the prohibition of *bal tashchit* and cause the waste or destruction of an object for the sake of being more stringent than the law

[260] B.T. Shabbos 140b. This can be overruled by other considerations, such as honoring the Sabbath or Holiday, where it is considered a mitzvah (commandment) to eat special food out of consideration of taste enjoyment, rather than purely out of health considerations.

[261] R. Menachem Treves, *Orach Mesharim* (Mainz, 1878), sect. 29:6, p.153. It is interesting to note that Maimonides, who was a noted physician of his time, considered excessive food consumption to be one of the major causes of illness (Maimonides, *Mishneh Torah*, ed. S. Frankel (Jerusalem and B'nei Braq, 2001), Hilchot Deot 4:1-20, vol.1, pp. 90-93). On a more recent note, researchers have established that reducing food consumption can have a significant role in reducing disease and extending the lifespan in humans (see, for example: Laura Johannes, 'Lean Times: The Surprising Rise Of Radical, Calorie-Cutting Diet - Could Self Deprivation Be the Secret To a Longer, Albeit Famished, Life?' *Wall Street Journal*, June 3, 2002).

[262] *Bal tashchit* is one of 613 commandments contained in the Torah. The majority of these commandments are only operative during the times when there is a Temple in Jerusalem.

[263] Vorhand, pp.193-196.

[264] Ibid, p.198.

[265] Ibid, p.200.

[266] Ibid, pp.164-165.

requires[267]. Similarly, R. Moses Feinstein (1895-1986) discusses a complicated question about kashering a cooking utensil (making an unfit cooking utensil fit for use according to Jewish dietary laws). He is asked, 'what if someone wants to be more stringent than the law requires and throw the utensil away rather than kasher it'? In response, he writes of his amazement that for the sake of a stringency the questioner is willing to violate the prohibition of *bal tashchit* [by disposing of a potentially useful object][268].

C. For a pressing need

If a person needs the space being occupied by a fruit-producing tree for a more pressing need, such as a place to build his house, then it is permitted by almost all authorities to destroy the tree growing on the space[269]. Most authorities agree that this only applies for a pressing need, and not for a lesser need such as to expand a house for more comfort (see section 3.1.5).

Choosing between subjective need versus economic value

Where there is a conflict over what object to use to meet a pressing need, it is preferable to destroy a less-needed object of higher economic value than a more-needed object of lower economic value[270]. For example, if drinking water is scarce, and a more expensive liquid such as wine can be used instead of water for less important needs such as washing, it would be preferable to use the wine for washing rather than the less expensive but more-needed drinking water (see section 3.2.2.4D for more discussion on water as a greatly needed resource of relatively low economic value).

D. If there will be more benefit from the destruction of the tree or object than from its preservation.

This refers primarily to economic benefit. This can be seen as a precedent to the cost-benefit analysis commonly used today (which will be discussed in more detail in chapter five (section 5.2.3.6) where a project or activity must demonstrate more benefit than the cost of performing the project or activity.

There is Rabbinic disagreement as to whether the determination of benefits must be objectively based – that is something the majority of people would agree to – or whether the one wanting to cut down the tree or destroy the object is permitted to rely on his own subjective judgement[271].

If allowing a fruit-producing tree to remain standing in its place will result in a [financial] loss greater than the value of the tree, then it is legally permitted to cut it down[272]. An example might be if the owner needs the location of the tree for another, more valuable use, such as building a house. For example, R. David Halevi Segal (1586-1667) writes[273]: *I have permitted someone who*

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[267] R. Menachem Azariah of Fano, *Sefer Sha'alot UTeshuvot* (Jerusalem, 1963), p.294.
[268] R. Moshe Feinstein, *Iggarot Moshe* (New York, 1959), vol. 6,Yoreh Deah no. 27, p.256.
[269] Vorhand, pp.66-70.
[270] Shtasman, p.131.
[271] Vorhand, p.59, 166.
[272] Ibid.
[273] Shulchan Aruch: commentary of R. David Halevi Segal, *Turei Zahav* (*Taz*), Yoreh Deah, vol. 3, 116:6, p.20. - עם התרתי לאחד שהיה לו קרקע אילנות לקוץ האילנות אע"פ שיש בהם פירות כדי לבנות בית דירה עליה

had trees on his land to cut down a tree, even if it is fruit-producing, in order to build a house on it.

R. Vorhand writes that if a fruit-producing tree weakens the soil, and therefore damages other trees of greater value, or if its branches prevent the sun from reaching crops growing underneath, or if birds that are attracted to the tree cause damage to nearby trees of greater value, then it is permitted to cut down the offending tree[274].

When determining whether a fruit-producing tree may be destroyed for a more valuable use, there is discussion of two different methods for assessing the value of the tree. One method uses the current market value of the tree, were it to be sold as a fruit-producing tree[275]. According to this method, there is an implicit discounting of the value of all future fruit production from the tree. A second method is to determine the value according to the total cumulative value of all the fruits the tree is likely to produce in its lifetime[276] without discounting the value of future production. Depending on which method is chosen, there can be a significant difference as to the value of the tree, and the determination of whether or not it may be destroyed. The first method is more in line with current economic practices. For example, in cost-benefit analysis, there is usually a discounting of the future[277]. The second method presents what might be considered a more sustainable approach. It would seem reasonable to use the second method for fruit-producing trees, because of the long-term stream of benefits they produce. For other objects that provide short-term benefit to man, it appears to me more sensible to discount the value of the future benefits.

E. If the tree or object is damaging the property of others

Jewish law prohibits causing damage to the person or property of others[278]. There is disagreement as to the Biblical source of this prohibition against causing damage to others. Interestingly, some of the legal decisors derive the prohibition against causing damage from the prohibition of *bal tashchit*[279]. The prohibition against causing damage to others applies even where the offender offers, beforehand, to fully compensate the victim for any damage he causes[280], or, even in cases where the potential damager has to incur significant personal loss in order to avoid damaging another.

Even if the damage caused by the fruit-producing tree is less than the value of the tree doing the damage, if the tree is damaging the *property of others* it should be cut down[281] unless a satisfactory arrangement can be reached with the owner of the damaged property to permit letting the tree remain.

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[274]Vorhand, p.63.
[275] Ibid, pp.99, 100.
[276]R. Yisrael Avraham Alter Landa, *Sefer Sha'alot UTeshuvot Beit Yisrael* (New York, 1994), sect. 2, no. 11 (Yoreh Deah), p.28, col. 1.
[277] See section 5.3.2.6 for more discussion on this point.
[278] See for example, R. Jacob ben Asher, *Tur,* Choshen Mishpat sect. 378, pp.237-245.
[279] R. Mordechai Yafeh, *Levush Ir Shushan* (Jerusalem, 2000), Choshen Mishpat 378:1, p. 597; R. Jacob be Asher, *Tur*: commentary of R. Yoel Sirkes, *Bais Chadash* (*Bach*), comment (a) Choshen Mishpat 378:1, pp.237-238.
[280]One possible alternative is for the potential damager to purchase the right from the potential victim to cause damage to his property. However, Jewish law would forbid this if the activity threatens the life or health of the victim.
[281] Vorhand, pp.86-87.

Where there is only a *risk* that a fruit-producing tree will cause damage to others, there is disagreement as to the permissibility of destroying the tree[282]. The determining factors are the level of risk, and what is at risk. If human life is at risk – for example, if a large tree might fall on a crowded thoroughfare – it would be not only permissible, but obligatory to remove the tree[283].

3.2.3 In all of the above cases, if there is a feasible alternative to destroying the fruit-producing tree or other object, for example, if a non fruit-producing tree, or another object of lesser value can be used instead, or if the fruit-producing tree can be uprooted and planted in another location rather than be destroyed, then one is obligated to choose the alternative and save the tree or object.

R. Moshe Sofer (1762-1838) rules that where it is permissible to remove a fruit-producing tree, the tree must be uprooted if possible rather than cut down[284]. Sofer brings a proof for his ruling from the Talmudic case of Rav Hisda, who instructed his servant to *uproot* an offending date palm tree (see section 3.1.2), instead of ordering him to cut it down.

According to R. Shneur Zalman of Liadi, the allowance to destroy a fruit-producing tree if the wood is more valuable than the fruits is only in the case where there is no other alternative source for the wood[285]. Where there is an alternative, the fruit-producing tree should be left to produce fruits.

We see from these rulings that even where the destruction of a fruit-producing tree is *justified*, but *avoidable*, one must try to avoid it. Even justifiable destruction should be kept to a bare miminum. This would apply to other resources as well. For example, R. Menachem Treves (19th century) writes that it is forbidden to destroy more than necessary (of any useful object) in order to use something for one's needs[286].

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[282] Ibid, p. 84
[283] See section 3.2.4A which discusses the legal obligation towards saving human life.
[284] R. Moshe Sofer, *Sefer Chatam Sofer* (Pressburg, 1864), vol. 1, Yoreh Deah responsum 102, p.34b.
[285] Vorhand, p.83.
[286] R. Menachem Treves, *Orach Mesharim* (Jerusalem, 1969), ch. 29, topic 9.

3.3 Summary

The conservation and proper management of the physical world and the resources it provides has a long history in the Jewish sources. This concern is crystallized in the prohibition of *bal tashchit* which has been extensively investigated in this chapter[287]. The findings of this investigation can be summarized, in the preliminary form of a *principle* of *bal tashchit*, as follows:

1. *Bal tashchit* focuses on the protection of everything which can produce or provide *benefit* to man.

2. The protection provided by the prohibition of *bal tashchit* is proportionate to the potential benefit the object can provide for man. Something which *produces* a stream of benefits is given more protection than something which *provides* one-time benefits. Based on the level of benefits produced or provided, we can separate objects into the following categories, along with the level of protection provided to each category by *bal tashchit*:

    A. *Human life and health* are given maximum protection. As discussed in section 3.2.2.4A, *bal tashchit* of the human body takes precedence over *bal tashchit* of all other objects. This may also be alluded to where the Jewish tradition compares a benefit-producing human to a fruit-producing tree (section 2.2.3).

    B. *Producers of streams of benefits* for man (symbolized in Deuteronomy 20:19-20 by *fruit-producing trees*) are given the next highest level of protection. Maimonides, in particular, stresses the extra protection given to fruit-producing trees over other objects (section 3.1.4). The protection of fruit-producing trees is so important that it is expressed in the form of at least one Biblical commandment, and according to some opinions, two or even three separate Biblical commandments (section 3.2.2.2). Additional protection results from the threat of danger involved in the destruction of a fruit-producing tree, which has more strength than a prohibition (section 3.2.2.3). There is also a precautionary-principle like mechanism that prohibits destruction in cases of doubt (section 3.2.2.2). Finally, even indirectly-caused damage or destruction to fruit-producing trees is proscribed (section 3.1.4).

    C. *Objects that provide benefit when consumed* (symbolized in Deuteronomy 20:19 by *fruits*) are given the next level of protection. Any objects which provide one-time benefit to humans are also protected by the prohibition of *bal tashchit*, although this is a lesser protection than the protection of fruit-producing trees (section 3.2.2.4). The focus of this protection may be on the *value* of the object to man, or the value of the benefits man derives from the object, rather than the object itself (section 3.1.4). Therefore, an object that provides benefit when consumed can be destroyed whenever the benefits derived though this destruction are greater than the value of the object in its present form. Whereas protecting fruit-producing trees is clearly Biblically-derived, protecting the objects in this category is possibly Rabbinically-derived, and less stringent (section 3.2.2.4G).

[287] Note: Due to my lack of understanding in these areas, I did not extensively investigate the Jewish mystical texts such as the Zohar. This may be a fruitful area of research for other, more qualified scholars.

3. In protecting that which can produce or provide *benefits* to man, the prohibition of *bal tashchit* is concerned with more than simply preventing the destruction of physical objects. The focus seems to be, rather, on the preventing the unnecessary loss of the ability of an object to produce or provide benefits for man. This is evident from the usage of the Hebrew word השחתה (hashchata) – which Hirsh translates as *corruption* and *degradation*, rather than destruction (see chapter two, section 2.1, and section 3.1 at the beginning of this chapter). This is also expressed in the focus in the Talmud and in the Rishonim on the *value* of an object – which I interpret as a measure of the expected benefits the object can provide.

4. There is a link between the prohibition of *bal tashchit* and man's level of *knowledge*. The greater the knowledge about the environment and the benefits provided by each of its elements to man, the greater the protection afforded by *bal tashchit*. While objects that provide no *known* benefit to man are not protected by the prohibition of *bal tashchit;* with man's increasing knowledge, the potential benefits from virtually everything in nature will eventually be apparent (as stated by Maimonides in section 3.2.2.4). Therefore, there is room to say that even objects of no known benefit for man should receive some level of protection – for future sake. Greater knowledge enables man to better realize the potential value and benefits from every aspect of his environment, as well as providing man with better ways to utilize and protect the environment[288].

5. There is also a link between the prohibition of *bal tashchit* and the *moral-ethical* condition and behavior of an individual or society. Acting destructively – which includes indirect destruction caused by using objects improperly – can have a harmful effect on the moral-ethical state of an individual, and eventually, of a society. A degraded moral-ethical state contributes to poorer moral-ethical behavior, including the causation of more needless destruction. This link finds particular expression in the writings of the author of the *Sefer haChinuch* and of R. Samson Raphael Hirsch (sections 3.1.4 and 3.1.5).

6. Emphasis on the importance of the prohibition of *bal tashchit* appears to be situation-dependent. In certain periods there was greater emphasis on *bal tashchit*, at least in the writing of certain leaders of the generation, and in other periods, the prohibition seemed to be almost ignored (section 3.1.6). The level of emphasis seems to be related to the level of material excess of the Jewish communities. We are now in a period of increasing interest in *bal tashchit* (see chapter 1), which is to be expected with the increased materialism of our times.

While my investigation has covered a large number of classical Jewish sources, three in particularly stand out because of the importance they placed on *bal tashchit* and the impact of their words in our understanding of the prohibition. These are Maimonides, the author of the *Sefer haChinuch* and R. Samson Raphael Hirsch. All three continue to play an influential role in Jewish thought. Maimonides – who has the most dominant influence of the three – provides, perhaps, the clearest and most logical overall approach to the prohibition of *bal tashchit* in the following areas:

[288] It is important to note that knowledge can also work in a destructive way. Increasing knowledge can allow man to more extensively exploit his environment in destructive ways. This point will be discussed in chapter four (section 4.3.4).

First, in asserting that everything on earth exists for man's benefit and only human ignorance prevents us from recognizing these benefits (section 3.2.2.4), Maimonides seems to imply that everything on earth should be protected, on some level, by *bal tashchit*. Secondly, Maimonides expands the definition of *bal tashchit* to include, on some level, the causation of any type of '*loss*' (beginning of section 3.1.4). This would seem to express *bal tashchit* as a 'macro-principle' against causing any net loss of value and/or utility in the world (as will be discussed in the next chapter (section 4.2.3). Thirdly, in his application of *bal tashchit*, Maimonides differentiates between *producers* of benefits (such as fruit-producing trees) and the *providers* of benefits (such as the fruits) themselves (section 3.1.4). Maimonides rules that the prohibition of *bal tashchit* gives *additional* protection to fruit-producing trees, whereas, the protection afforded to objects providing benefits is based on the current *value* of the benefits to man. Finally, Maimonides emphasizes that the prohibition of *bal tashchit* applies not only to directly causing damage or destruction but even to *indirectly* causing damage or destruction, which is exceptional in Jewish law (beginning of section 3.1.4)

The author of the *Sefer haChinuch* and R. Samson Raphael Hirsch stand out for their strong positions on the importance of *bal tashchit*, particularly in times of material excess and overconsumption (see point 5 above). Both of these authorities stress the importance of the moral-ethical aspects of the prohibition, showing the importance of what could be called a behavioral approach. The author of the Sefer haChinuch relates the protection and conservation of resources to 'good' and the needless destruction of resources to 'evil'.

R. Hirsch, who is extensively quoted in the second and third chapters, seems to be unique amongst the major Rabbinic leaders in more-recent Jewish history for his appreciation of the natural world and of *bal tashchit*. There are several factors that, I believe, contribute to this appreciation. First, Hirsch lived in Germany after the 'emancipation' of the Jewish communities. This was a time when the Jewish population was relatively open to the influence of the surrounding German culture, which manifested a stronger connection with what could be called 'naturalism' than that of Diaspora Jewry[289]. Related to this, Hirsch lived during the time of the industrial revolution in Western Europe, which promoted greater materialism and, sometimes, levels of material excess and waste unknown in previous times. There also appeared, at this time, some ideological resistance to this new materialism[290], which may have had influence on Hirsch's writings. The extent to which Hirsch was personally influenced by these factors is a matter of debate[291]. What is certain, however, is that Hirsch was writing for co-religionists who were influenced by these changes. With a university background (Hirsch studied at the University of Berlin) Hirsch was also more educated in secular subjects, such as the natural sciences, than most of his Rabbinic predecessors and contemporaries, particularly those in Eastern Europe or Muslim countries.

[289] The strong interest in 'naturalism' in German and much of European culture during Hirsch's time is well-documented. See for example: Richard Grove, "The Origins of Environmentalism", *Nature*, vol. 345 (1990), pp.11-14; and David Pepper, *Modern Environmentalism, An Introduction* (London, 1996), pp.168-188. Pepper cites a number of influential 'naturalists' such as Ernst Haeckel (1834-1919), who coined the word 'ecology' in 1866. In addition, the writings of Jewish philosopher Baruch Spinoza (1632-1677), whose philosophy later helped spawn the 'Deep Ecology' movement towards the end of the 20th century (Pepper p.19), were influential amongst many Jews assimilating into European culture in Hirsch's time.

[290] For example, Pepper (Ibid.) cites a number of examples of 'back to nature' and 'back to the land' movements that sprang up as a reaction to the rapid industrialization and urbanization taking place during Hirsh's time.

[291] See for example: Yehuda Levi, "Rabbi Hirsch, Myth and Fact", *Tradition* 31:5-22 (Spring 1997), and Norman Lamm, *Torah Umada*, 5th chapter, (Northvale, NJ, 1990) for contrasting views on the extent of the influence of German culture on Hirsch's thinking.

Finally, Hirsch may have had, on his own, an unusual sensitivity to and appreciation for nature, which was evident in many of his writings[292].

From this chapter, it is apparent that there are gradations of protection from *bal tashchit*, based on the value or benefit to man. Nothing is absolutely without value or benefit, but there are tradeoffs. Some things should be destroyed before others. To use the example given in Deuteronomy 20:19-20, non fruit-producing trees should be destroyed to build a siege before fruit-producing ones. So, *'needless'*, as in *needless destruction* really means making incorrect tradeoffs, wherein something more valuable or beneficial is destroyed for the sake of something less so, resulting in less total benefit to man.

The following chapter will further develop a principle of *bal tashchit* based on the legal rulings discussed in this chapter.

[292] For example, in an essay titled "From the Notebook of a Wandering Jew" Hirsch writes: *Did you think, dear N___, that your letter would still find me within my four walls? 'The winter is over, the blossoms are showing, the time for singing has come,' could your friend stay in the house? No, my dear. Even as a child I envied our forefathers when, on the night my father presented them to me with their feet sandaled, their loins girded, the wanderer's staff in their hands, the bread-bundles on their shoulders; I would have given the sweetest charoses for a drink of bitter water if I could have wandered thus for forty years with them in the desert. I almost believe that all you homebodies would one day have to atone for your staying indoors, and when you would desire entrance to see the marvels of heaven, they would ask you, 'Did you see the marvels of God on earth?' Then, ashamed, you would mumble, 'We missed that opportunity.' How different were our Rabbis in this respect. How they breathed and felt, thought and lived in God's marvelous nature. How they wanted to awaken our senses for all that is sublime and beautiful in Creation. How they wanted to teach us to fashion a wreath of adoration for God out of the morning's rays and the evening blush, out of the daylight and the night shadows, out of the star's glimmer and the flower's scent, out of the roar of the sea and the rumble of the thunder, the flash of the lightning. How they wanted to demonstrate to us that every creature was a preacher of His power, a monitor of our duties; what a Divine revelation they made of the book of nature*. From: *Collected Writings of Rabbi Samson Raphael Hirsch* vol. 8 (Jerusalem, 1984), p.259.

Chapter 4 – Developing a *principle* of *bal tashchit*

Introduction

The previous two chapters described the prohibition of *bal tashchit*, from its Biblical origin in Deuteronomy 20:19-20 to the legal rulings and principles of its application up to the present time. While the legal prohibition of *bal tashchit*, as described in chapter three is limited in scope, it is evident, in my opinion, that a broader *principle* of *bal tashchit* (as suggested by Hirsch and others (see chapter one) can be derived from the sources discussed. The previous chapter summarized the beginnings of a *principle* of *bal tashchit* as follows:

1. *Bal tashchit* focuses on the protection of everything which can produce or provide *benefit* to man.

2. The protection provided by the prohibition of *bal tashchit* is proportionate to the potential benefit the object can provide for man. Something which *produces* a stream of benefits is given more protection than something which *provides* one-time benefits. Based on the level of benefits produced or provided, I can separate objects into the following categories, along with the level of protection provided to each category by *bal tashchit*:

   A. *Human life and health* are given maximum protection.

   B. *Producers of streams of benefits* for man are given the next highest level of protection.

   C. *Objects that provide benefit when consumed* are given the next level of protection.

3. The focus of *bal tashchit* seems to be on preventing the unnecessary loss of the ability of an object to produce or provide benefits for man, rather than focusing on the object itself.

4. There is a link between the prohibition of *bal tashchit* and man's level of *knowledge*.

5. There is also a link between the prohibition of *bal tashchit* and the *moral-ethical* condition and behavior of an individual or society.

This chapter will attempt to further develop a general principle of *bal tashchit* with broader and more universal applications than the prohibition. This will involve integrating the above description of *bal tashchit* with relevant concepts in modern thought.

4.1 – Describing *bal tashchit* as a 'utilitarian approach' to the management of resources

Bal tashchit takes what I am calling a *utilitarian* approach[293] to the relationship between man and his environment. The focus is on the *benefits* potentially produced or provided by the environment for satisfying man's needs and wants and enhancing his life, rather than on any intrinsic value of the environment independent of man.

While the utilitarian approach I am describing may sound starkly anthropocentric, it would be more accurate, in my opinion, to say that this is a theocentric approach[294] which focuses on doing the will of the Creator rather than the bidding of man (see Appendix A for more discussion on this point). In asserting that the Hebrew Bible is not anthropocentric, Boersema correctly points out that[295]: *the Biblical creation narrative does not culminate in the creation of the human race, but in the seventh day, the sabbath.* I must add, however, that the process which culminates in the 'sabbath' or ultimate conclusion, is only reached through the creation of man. From a Jewish perspective, the participation of man, as the 'free agent' that can choose to do the will of the Creator, or the opposite, is a necessary step in this process. Everything created before man, meaning the 'natural' world, is there to benefit man in bringing the world to the culmination which will benefit man together with the rest of the creation. In other words, in fulfilling the role for which he was created, man benefits from the natural world and also benefits the natural world[296]. This is the other side of the utilitarian approach that I am trying to describe. Man also produces benefits which improve the world. Nevertheless, the emphasis with *bal tashchit* – at least as I have described it up to this point - is purely on the benefit that man receives from the environment, rather than on any benefits received from man.

Bal tashchit focuses on the protection of man's life and the *benefits* produced or provided by the environment that enhance his life. I will define *benefit* as: anything that *satisfies the needs or wants of man and add to his wellbeing*. In other words, *bal tashchit* prohibits destroying or degrading anything that satisfies human needs and wants and adds to human wellbeing. The exception is where the destruction or degradation will better satisfy human needs and wants and lead to greater wellbeing than without the destruction or degradation.

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[293] The utilitarian approach that characterizes the prohibition of *bal tashchit* is not purely economic. In fact, as will be discussed in chapter five, pure economic utility (narrowly defined) occupies a relatively low position in the hierarchy for resource use. Rather, utility is better defined here as the potential benefit to man – in enabling him to satisfy his needs and fulfill his role in this world - that could be derived from the object in question.

[294] For non-believers, this is understandably a moot point. It may be that the closest alternative for them, relative to understanding the principle of *bal tashchit*, would be a modified Gaia hypothesis wherein man is seen as an unequal partner in the wellbeing of a single living organism which makes up the entire planet. On the one hand, man needs to realize that there is something bigger and more important than him to whom he must answer (in the case of the Gaia hypothesis, this would presumably be the living planet). On the other hand, man must realize that his superior intelligence is an asset that places on him added responsibilities vis à vis the other components that make up his environment, whose welfare he is also obligated to safeguard. Putting man on equal footing with other living beings in his environment would, in my opinion, have a destructive effect on both man and the world, as I will discuss in the next chapter (section 5.3.3.3).

[295] Boersema, p.246.

[296] See for example Appendix A which quotes R. Moshe Chaim Luzzatto: *In truth, Man is the center of a great balance. For if he is pulled after the world, and is drawn further from his Creator, he is degraded, and he degrades the world with him. And if he rules over himself and unites himself with his Creator, and uses the world only to aid him in the service of his Creator, he is uplifted and the world is uplifted with him.*

For example, a fruit-producing tree produces benefits for man in the form of edible fruits, oxygen, shade, beauty, carbon sequestration, and soil protection, amongst other things. These benefits help satisfy man's needs and wants and contribute to his wellbeing. The tree may be destroyed only if the benefits likely to result from this destruction, such as the freeing up of the location occupied by the tree, and the wood made available for building or burning, better satisfy human needs and wants and contribute more to man's overall welfare than the benefits provided over the anticipated lifetime of the tree were it left to produce its benefits.

With *bal tashchit*, the concern is with making the best possible use of the environment, and more precisely, with each of the components making up the environment which provide benefit to man. G.T. Miller defines these components as *resources*, writing[297]: *In human terms, a* resource *is anything we get from the environment (the earth's life support systems) to meet our needs and desires.* In other words, a *resource* can be defined as anything from the environment which produces or provides benefit to man. According to this definition, *bal tashchit* can be considered the management of resources to produce and provide the maximum benefit to man.

4.1.1 – Clarifying what is meant by a 'utilitarian' approach

I have described *bal tashchit* as being a *utilitarian* approach to the management of resources. How does *bal tashchit* compare, in this respect, with other approaches to the management of resources? Chiras and Reganold write[298]: *During the past two centuries, four resource management ideologies have emerged in the United States and elsewhere: 1. exploitation, 2. preservation, 3. the utilitarian approach, and 4. the ecological or sustainable approach*.

The *exploitation* approach (described by Chiras and Reganold as *human-centered*), suggests that a given resource should be used as intensively as possible to provide the greatest profit to the user, regardless of the long-term effects. The *preservation* approach (described as *nature-centered*, and as the antithesis of the exploitation approach) suggests that remaining natural resources should be preserved, set aside, and protected, instead of being utilized to satisfy mans needs and wants. The *utilitarian* approach (described as *fairly human centered, but a step in the right direction*) suggests that resources should be managed so that they will never be exhausted (a concept otherwise referred to as *sustained yield*). This approach promotes the wise use of resources to ensure lasting supplies.

The *ecological* or *sustainable* approach (described as *being both human-centered and nature-centered,* and *giving equal consideration to both*) is sometimes referred to as *ecosystems management*[299]. Chiras and Reganold describe this approach as requiring ecosystem managers to think in terms of whole systems, not just isolated parts of them. The ecological/sustainable approach to resource management requires a long-term systems view. Ecosystems are managed to protect multiple components. Protecting the stability and diversity of ecosystems is vital to this approach. Additionally, Chiras and Reganold write that this approach also[300]: *requires better management of ourselves – our systems and society… we must live our lives and conduct our business affairs in ways that do not deplete the earth's resources or foul its air, water, and soil.*

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[297] G. Tyler Miller, Jr., *Living in the Environment*, 10th ed. (Belmont, California, 1998), p.11.
[298] Daniel D. Chiras and John R. Reganold, *Natural Resource Conservation*, 9th ed. (New Jersey, 2005), p.12.
[299] An ecosystem is defined as a *dynamic complex of plant, animal, and micro-organism communities and the nonliving environment interacting as a functional unit* (see: Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington D.C., 2005), Preface, p.vii).
[300] Chiras and Reganold, p.15.

Most of what Chiras and Reganold are calling the *ecological or sustainable approach* to resource management is also – with the exception of giving equal consideration to both humans and nature – included in what I would call a '*utilitarian*' *approach*. All approaches to resource management are ultimately based on what is perceived to in the best self-interest of whoever is managing the resources. Can it be otherwise? With increasing knowledge of the functions of the ecological systems around him, and their importance to his well-being, has come a broader view of what is in man's best self-interest. Man can never 'escape' the limitations of his own mind and his own self-interest. He can only attempt to expand this self-interest to include more and more of the world around him, seen in, perhaps, an ever-increasing timescale. But, in doing so, man runs the risk of so 'diluting' his immediate self-interest, his immediate needs and wants, as to render them almost meaningless. He can only do this, it seems to me, if he is already in the enviable position of having all of his immediate needs and wants met. Thus, it appears to me, ideas of nature being of equal importance to man (with very few exceptions, at least in the western world) tend to originate from relatively wealthy individuals and societies who are past the point of concern over meeting their own short-term needs (such as in Western Europe and North America), not from individuals or societies still struggling to provide for their basic needs for survival.

4.1.2 – Defining resources - from what does man benefit?

As I wrote above, the utilitarian approach of *bal tashchit*, focuses on making the best possible use of the environment[301] – and more precisely, with the components making up the environment which provide benefit to man, which we are calling *resources*. These resources include lakes and rivers, forests and grasslands, and all of the organic and inorganic, living and non-living parts of the environment which bring benefit to man.

Many components of the natural environment don't clearly contribute to the well-being of man, and are therefore not normally considered resources[302]. For example, there are vast expanses of desert sand in North Africa, Asia, Australia and North and South America which are not normally considered resources. There are many species of plants and animals that don't provide any known benefit to man. When discussing the natural environment, therefore, it is important to make a distinction between 'resources' and non-resources. How is this distinction made?

Resources provide tangible benefit, in the form of value and utility to man. For example a stand of trees may provide edible fruits or nuts as well as timber for building or pulp for paper – all of which provide benefit to man. An oil field provides oil and its derivatives which play an important role in the economy of most of today's world. It is the value or utility of the objects that make them important as *resources*. How is this value defined? Is this value an intrinsic part of the object itself or is it a separate entity?

While resources themselves can be consumed, or otherwise degraded or destroyed, the matter and energy making up the resources remains, albeit in a different form, as will be described below. What gives value and utility to matter and energy to make it into a resource and what is it – in the same matter – that becomes consumed, degraded or destroyed? In my opinion, these questions need to be addressed in order to properly understand the utilitarian approach of *bal tashchit*. I will attempt to address these questions in the following section, which will introduce and utilize several abstract concepts. I am using these concepts only to help explain, in modern terms, what I believe is a helpful and original approach to understanding *bal tashchit*.

[301] While *bal tashchit*, as described at the beginning of this chapter, gives maximum protection to the human body, the body can also be considered to be the (closest and most important) 'environment' for the soul, providing the soul with a vehicle to function in the physical world, as described in section 3.2.2.4A.

[302] Chapter three (section 3.2.2.4) established that, in the Jewish tradition, everything in the created world was created for the benefit of man, and therefore, is a potential resource. Therefore, there is a need to distinguish between those objects and materials which are today recognized to give benefit to man, which we call resources, and those rest, which are not recognized as being of benefit – but which will probably in the future be found to be of benefit.

4.1.3 Physical laws relating to the definition of a resource

I will begin by reviewing the following physical laws:

Law of Conservation of Matter – The *law of conservation of matter* establishes that matter – the substance making up the material world, including all of its resources – can be neither created nor destroyed[303]. While matter cannot be destroyed, it can be changed into different forms and ordered in different ways, which can have a tremendous influence on the characteristics of an object.

First and second Laws of Thermodynamics – Similar to the law of conservation of matter, the *first law of thermodynamics*[304] states that in all physical and chemical changes, energy is neither created nor destroyed, but energy may be converted from one form to another[305]. For example, when a piece of wood is burned in a wood stove, chemical energy contained in the wood is changed into heat energy, with no change in the total amount of energy. The form of energy determines the usefulness and value of the energy to man.

One formulation of the *second law of thermodynamics*[306] is that when energy is changed from one form to another, some of the useful energy is always *degraded* to less useful, *less ordered* or higher entropy energy[307]. *Entropy* can be simply defined as the degree of degradation of form or order[308] in a system towards a state of *homogeneity*. Within a *closed* or *isolated* system (as defined below), the amount of entropy irreversibly increases over time up to a maximum, in which the energy is equally distributed throughout the system. For example, when the chemical energy in a piece of wood burning in a stove is changed into heat energy, only some of this energy can be used for cooking food or boiling water. The majority of the heat energy is released into the environment or absorbed by the walls of the stove from where it is more slowly released into the environment. The heat will continue to disperse from the hot stove, into the cooler environment until the temperature of the stove is equivalent to the temperature of the surrounding environment and entropy is maximized.

It is important to emphasize that the second law of thermodynamics operates primarily within *closed* systems (in which energy can leave or enter from outside the system but matter cannot) or *isolated* systems (in which neither matter nor energy can enter or leave), as opposed to *open* systems, where both matter and energy can enter or leave the system[309]. For example, a forest is an open system within the global ecosystem because not only does it receive energy from the sun, but there is also an exchange of matter into and out of the system. This exchange of matter may be in the form of evaporation and precipitation of water, as well as those materials which are transported into and out of the system by living organisms, or by water or wind. The earth's ecological system – in totality - operates as a closed system, allowing the import and export of

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[303] Antoine Lavoisier is credited with formulating the Law of Conservation of Mass in 1785.
[304] Julius Robert Mayer is credited with formulating the Law of Conservation of Energy in 1842.
[305] G. Tyler Miller, Jr., *Living in the Environment*, 10th ed., (Belmont, California 1998), p. 84.
[306] A number of people are credited with making important contributions to the understanding of the second law of thermodynamics including Sadi Carnot (1824), Rudolf Clausius (who was the first to formulate the second law in 1850), Lord Kelvin (1851), Ludwig Boltzmann, and J. Willard Gibbs (1876).
[307] Miller, p.84. In order to be 'useful', energy must be sufficiently concentrated. It is the gradient or difference in energy concentration between an object and its surrounding that determine how much 'useful' energy the object can provide. In general, the greater this gradient, the more useful the energy. The degradation of this gradient makes the energy less useful.
[308] For example, see Chiras and Reganold, *Natural Resource Conservation*, 9th ed., (New Jersey: Pearson Prentice Hall, 2005), p.51.
[309] Yunus Cengel and Michael A. Boles, *Thermodynamics, an Engineering Approach*, 4th ed. (New York, 2002), p. 9.

energy but not of physical matter[310]. In the words of Miller[311]: *The earth is a closed system that can receive energy from the sun but loses essentially no matter into space and receives almost negligible amounts of matter from space*. Therefore, within the earth's closed system, there is a natural tendency for the form or order of energy to degrade. The significance of closed systems relative to *bal tashchit* will be discussed further in section 4.5.

4.1.4 Introduction to the concept of '*Quality*'

While physical resources are made up of matter and energy which can be neither created nor destroyed, the forms in which the matter and energy take can vary, and can be changed by man. This can include changes in the purity, concentration, structure and geographical location of the matter and energy relative to the surroundings or reference state. Some of these changes are desirable and some are undesirable to man. The surroundings are important relative to any resource because they can strongly influence the resource. Generally, as indicated above in the description of the second law of thermodynamics, an object and its environment tend towards homogeneity.

The form in which matter or energy take, relative to its desirability to man, can be called *quality*. Miller writes[312]: *From a human standpoint, we can classify matter according to its quality or usefulness to us. Matter quality is a measure of how useful a matter resource is, based on its availability and concentration. High quality matter is organized, concentrated, and usually found near the earth's surface, and has a great potential for use as a matter resource. Low quality matter is disorganized, dilute, and often deep underground or dispersed in the ocean or the atmosphere and usually has little potential for use as a matter resource*.

For example, bauxite, a mineral ore from which aluminum is extracted, can be considered low quality matter. In its natural state, bauxite is neither very useful nor valuable to man. The aluminum contained in the bauxite is difficult to access, highly dispersed, and not in a useable form. An aluminum container, on the other hand, containing the same aluminum as was present in the bauxite, is considered to be high quality matter. The aluminum in the container is accessible, concentrated and in a very useable form.

Miller also describes *quality* in relation to energy[313]: *From a human standpoint, the measure of an energy source's ability to do useful work is called its* energy quality. *High-quality energy is organized or concentrated and can perform much useful work. Examples are electricity, coal, gasoline, concentrated sunlight, nuclei of uranium-235 used as fuel in nuclear power plants, and heat concentrated in relatively small amounts of matter so that its temperature is high*[314]. *By contrast, low-quality energy is disorganized or dispersed and has little ability to do useful work.*

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[310] Relatively insignificant amounts of matter may enter or leave the system outside of the influence of man, for example, when meteorites penetrate the atmosphere and impact on land. Man has become increasingly capable of transferring material from place to place, including outside of the earth's ecosystem (for example with space exploration). Furthermore, matter can be transformed into energy and vice versa. Nevertheless, these exceptions are not considered significant within the scope of this discussion.

[311] Miller, p. 93.

[312] Miller, pp 76-77.

[313] Ibid, p.78.

[314] It is important to note that the examples given of 'high-quality energy' all result from human interaction to extract, refine and/or concentrate a natural form of energy into a more beneficial order. All of the human interactions required to increase energy quality require the input of additional energy from somewhere in the system, and result in a localized increase in energy quality, often at the cost of a net loss of energy quality in the entire global ecosystem.

Hawken et al. describe a similar concept, which they call "*order* or *quality*" when they write[315]: *What is consumed [by man] from the environment is not matter or energy but order or quality – the structure, concentration, or purity of matter. This is a critically important concept, because it is "quality" that business draws upon to create economic value. Instead of focusing on whether physical resources will run out, it is more useful to be concerned about the specific aspects of the quality that natural capital produces: clean water and air; healthy soil, food, animals, forests, pollination, oceans, rivers; available and affordable sources of energy; and more.* The additional point that Hawken et al. add, about how 'natural capital' *produces quality* will be addressed below in section 4.2.5.C.

Differences in quality or order can make a tremendous difference in the basic characteristics of matter and/or energy. For example, both diamonds and graphite are made from exactly the same elemental matter – carbon. The difference in utility between diamonds and graphite results from the order or structure in which the carbon atoms are arranged.

For my purposes, in developing a principle of *bal tashchit*, I am concerned with the different structures or orders of matter or energy relative to the degree that they are *beneficial* to man[316]. As discussed in chapter three (section 3.2.2.4), Jewish tradition posits that everything in this world was created for mans benefit. Furthermore, in appendix A, I discuss how, according to Jewish tradition, everything in the natural world has a purpose for which it was created, and when used for that purpose, it contributes to the progress of man and the world. In other words – from a Jewish perspective – there are certain orders of matter and energy that form *resources* that can benefit man in meeting his purpose. Likewise, as I will discuss at the end of this chapter, there are certain ways in which man can utilize the physical world in which man can also benefit the world in meeting its purpose. This is consistent with the dictionary definition of *order* as: *a condition in which each thing is properly disposed with reference to other things and to its purpose* [317]. This concept of *order*, perhaps better termed *beneficial order*, plays an important role in the principle of *bal tashchit*.

What I am calling quality or *beneficial order* is that part of a resource that is consumed or otherwise utilized by man to meet his needs and wants. Later, the same matter or energy minus this beneficial order will be released back into the environment[318]. Man, and all living organisms require a constant supply of beneficial order in order to survive. Theoretical physicist Erwin Schrödinger expresses this idea in thermodynamic terms, as *negative entropy*. In his book *What is Life*, Schrödinger writes[319]: *Life seems to be orderly and lawful behavior of matter... a living organism continually increases its entropy – or, as you may say, produces positive entropy – and thus tends to approach the dangerous state of maximum entropy, which is of death. It can only keep aloof from it, i.e. alive, by continually drawing from its environment* negative entropy – *which is something very positive… What an organism feeds upon is* negative entropy. *Or, to put it*

[315] Paul Hawken, Amory Lovins and L. Hunter Lovins, *Natural Capitalism* (New York, 1999), p. 148.
[316] In absolute terms, some type of order is incorporated into all physical matter and energy. Even at maximum entropy, when energy is evenly distributed, this too is, objectively speaking, a form of order. It is, however, a permutation of order that man is unable to utilize for doing work. What is important to us, in discussing the benefit man derives from objects, is whether the particular order incorporated into the matter and/or energy in the object is beneficial to man, and how beneficial it is.
[317] Random House Webster's Unabridged Dictionary, p.1362.
[318] This matter and energy can be released back into the environment in the form of wastes (including waste gases such as carbon dioxide, or waste liquids and solids excreted by an organism, or, ultimately, in the form of a dead body whose matter and energy are returned to the environment as the *order* is decomposed.
[319] Erwin Schrödinger, *What is Life* ? (originally published in 1944), available at: http://home.att.net/~p.caimi/Life.doc.

less paradoxically, the essential thing in metabolism is that the organism succeeds in freeing itself from all the entropy it cannot help producing while alive (emphasis added).

4.1.5 – Utility

Another concept, commonly used in economics, which is related to our definition of quality or beneficial order is *utility.* Utility is defined here as the usefulness of an object to man in meeting his needs or wants. In other words, *utility* is a measure of the benefit that can be derived from an object. It is the *utility* of matter which determines its status as a resource.

For example, economist Alfred Marshall writes[320]: *Man cannot create material things. In the mental and moral world indeed he may produce new ideas; but when he is said to produce material things, he really only produces* utilities*; or in other words, his efforts and sacrifices result in* changing the form or arrangement of matter to adapt it better for the satisfaction of wants. *All that he can do in the physical world is either to readjust matter so as to make it more useful, as when he makes a log of wood into a table; or to put it in the way of being made more useful by nature, as when he puts seed where the forces of nature will make it burst out into life*

It is sometimes said that traders do not produce: that while the cabinet-maker produces furniture, the furniture-dealer merely sells what is already produced. But there is no scientific foundation for this distinction. They both produce utilities*, and neither of them can do more: the furniture-dealer moves and rearranges matter so as to make it more serviceable than it was before, and the carpenter does nothing more. The sailor or the railway-man who carries coal above ground produces it, just as much as the miner who carries it underground; the dealer in fish helps to move on fish from where it is of comparatively little use to where it is of greater use, and the fisherman does no more…*

Consumption may be regarded as negative production. Just as man can produce only utilities, so he can consume nothing more. He can produce services and other immaterial products, and he can consume them. But as his production of material products is really nothing more than a rearrangement of matter which gives it new utilities; so his consumption of them is nothing more than a disarrangement of matter, which diminishes or destroys its utilities. Often indeed when he is said to consume things, he does nothing more than to hold them for his use, while, as Senior says, they "are destroyed by those numerous gradual agents which we call collectively time[321]*." As the "producer" of wheat is he who puts seed where nature will make it grow, so the "consumer" of pictures, of curtains, and even of a house or a yacht does little to wear them out himself; but he uses them while time wastes them [emphasis added]*.

In the words of ecological economist Herman Daly[322]: *Alfred Marshall's view that production of goods is a rearrangement of matter that creates utility and consumption is a rearrangement of matter that destroys utility incorporates the physical laws of matter conservation. Matter and energy cannot be created in production; rather, useful structure is added to matter/energy by the*

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[320] Alfred Marshall, *Principles of Economics*, 8th ed. (London, 1920), p.63.

[321] The *time* mentioned here by Marshall is apparently referring to the natural degradation that takes place over time. Indeed, increasing entropy has been referred to as the 'arrow of time' because it is an irreversible process that marks the unidirectionality of time.

[322] Herman Daly, "Consumption: Value Added, Physical Transformations, and Welfare," in *Getting Down to Earth: Practical Applications of Ecological Economics*, eds. R. Costanza, O. Segura, and J. Marinez-Alier, (Washington, DC, 1996), p.42.

agency of labor and capital. The value of this useful structure is referred to as value added and is used up in consumption.

4.1.6 – Introduction of a new terminology – Quality-Utility (*QU*)

So far, I have discussed a concept which has been described above as: *quality, beneficial order, negative entropy, utility,* and *useful struc*ture. Each of these terms, in my opinion, are describing the same basic idea, which is an intangible entity that makes matter and energy more beneficial for man. For the sake of simplicity, I will propose a single new term – Quality-Utility, or *QU* - to express this entity. *QU*, as I am introducing it, shares the physical characteristics described above (such as useful order or structure) along with the economic characteristics described for *utility* (current usefulness and ability to provide benefits to man).

QU represents the essential difference between a resource, from which man can benefit, and non-resource matter and energy. *QU* is what man uses and/or consumes in order to meet his needs and wants when he uses resources from his environment. I can now redefine *resource management*, for this thesis, as *the management of QU*. Similarly, *bal tashchit* can be defined as the *prohibition against needlessly destroying or degrading QU*.

In other words, resources consist of an entity called *QU*, from which man benefits, incorporated into matter and energy. *QU* is incorporated in the matter and energy until it is consumed or otherwise degraded. What remains after this *QU* is consumed or degraded is lower quality matter and energy of either diminished or zero utility (perhaps even negative utility as I will describe below)[323].

4.1.7 - Important characteristics of *QU*

There are several important characteristics of *QU* in relation to the principle of *bal tashchit* that bear further discussion at this point.

A. Quantifiability – *QU* is an abstract concept that can not be directly quantified. *QU* can be indirectly quantified, to some extent, in economic terms or in physical terms. In *economic* terms, *QU* can be indirectly quantified by how much money people are willing to pay for the benefits they can expect to derive from the *QU* in a good or service. This method of quantification of *QU* is consistent with the Jewish tradition, in which the prohibition of *bal tashchit* was established thousands of years ago. For example, in chapter three (section 3.1.2) I described the concept of *m'uleh b'damim*, where the level of what I am here calling *QU* is estimated as the monetary value. Monetary value was, and continues to be the primary means for quantifying value.

As I will discuss below in section 4.1.7.C, energy has a special relationship with *QU*. In recent times, there have been attempts to indirectly quantify what I am calling *QU* in *physical* terms through this link with energy - either by calculating the energy required to produce the *QU* (EMERGY analysis) or the amount of (ordered or high *QU*) energy that is available for doing work (exergy analysis) in a good or a service.

[323] It should be noted that there are exceptions to this rule. For example, some durable goods such as well-built buildings, can maintain their utility for relatively long periods of time. A house can maintain its utility for hundreds of years, providing long-term utility with minimal degradation. These exceptions are usually very expensive (e.g. a house or other building), require frequent inputs in the form of maintenance, and only gradually release their utility.

Robert Herendeen describes the rationale behind *EMERGY* analysis as[324]: *The sun runs the biosphere and thus supports us, not just directly through food crops, the water cycle, and so on, but indirectly through the environment's ability to absorb and process our wastes, even to support evolution and the development of species. The solar energy needed, directly and indirectly, to allow production of a given good or service is called EMERGY*[325]. EMERGY analysis is an attempt to calculate the amount of solar energy equivalents required to produce goods and services.

Exergy can be defined as the useful part of energy for a system in its environment. Cutler Cleveland writes[326]: *from an accounting perspective, exergy is appealing because it is based on the science and laws of thermodynamics and thus has a well-established system of concepts, rules and information that are available widely*. This is in contrast to EMERGY analysis, whose underlying rules and information Cleveland finds less clear[327]. While exergy is classically defined in terms of energy, Swedish physicist Göran Wall greatly broadens his definition of *exergy*[328] to equate it with Schrödinger's concept of *negative entropy* that was mentioned above, writing: *Schrödinger says in his book 'What is life?' that "we feed on negentropy". He might as well have said "we feed on exergy". Exergy is the fuel for all systems with the ability to maintain themselves, such as the biosphere, an ecosystem, a species, or a living organism… Exergy is a measurement of how far a certain system deviates from a state of equilibrium with its environment*.

In theory, all of the above methods could be useful tools for quantifying what I am calling *QU*. In reality, each method is seriously limited for such a role. Quantifying *QU* according to *monetary value* is problematic, particularly with non-marketed environmental goods and services, where the difficulties in assigning monetary value has been well documented[329].

Both *EMERGY* and *exergy* are also severely limited as tools for quantifying *QU*. One problem is definitional. Some proponents of both eMergy and exergy have broadened their definitions of each to the point that they become synonymous with what I am calling *QU* and cannot be directly quantified[330]. On the other hand, when defined in a more restricted manner, so that they can be more directly quantified, both eMergy and exergy can miss important aspects of *QU*. For example,

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[324] Robert A. Herendeen, "EMERGY, value, ecology and economics", *Handbook of Environmental and Resource Economics*, ed. Jeroen C.J.M. van der Bergh, (Cheltenham, 1999), p.955.

[325] Herendeen's words also describe the importance of the sun's energy in the life-supporting ecosystem services that will be further discussed below in section 4.1.7.C.

[326] Cutler J. Cleveland, "Net Energy Analysis", *Encyclopedia of Earth*, (Washington, D.C. 2007), p.17, available at: http://www.eoearth.org/article/Net_energy_analysis

[327] Ibid, p.16.

[328] Göran Wall, *Exergy – A Useful Concept Within Resource Accounting*, Institute of Theoretical Physics, Report no. 77-42, Chalmers University of Technology and University of Goteborg, Sweden, 3rd ed. (1986). Available at: http://exergy.se/goran/thesis/index.html

[329] See for example R. David Simpson, "Economic Analysis and Ecosystems: Some Concepts and Issues", in *Economics of the Environment, Selected Readings*, edited by Robert Stavins, 4th ed (New York, 2000), pp.529-541, who discusses some of these difficulties. Some of these difficulties will also be discussed in chapter 5 (section 5.2.3.5 and 5.2.3.6).

[330] Wall (see above) broadens his definition of *exergy* to be synonymous with what Schrödinger called negative entropy or negentropy. D.M. Scienceman, who is credited with coining the term 'eMergy', goes even further, writing: "The concept of GOD is merely a 'personification' of eMergy." (see: D.M. Scienceman, *The EMergy Synthesis of Religion, and Science*, Center for Environmental Policy, University of Florida, 1995, p.1).

Cleveland points out that neither EMERGY nor exergy vary with, nor do they necessarily reflect many of the important attributes of objects that determine their usefulness to man[331].

These limitations in the quantifiability of *QU* are not necessarily a hindrance. As I will discuss in the next chapter (section 5.2), the principle of *bal tashchit* that I am formulating does not require the quantification of *QU* outside of those goods and services that are commonly marketed, and whose *QU* can be satisfactorily quantified by market prices.

B. The degradation of *QU*

Whereas the matter component of resources is constantly cycling in the ecosystem from one form to another (for example, water cycling in the hydrological cycle, or nitrogen cycling in the nitrogen cycle), the *QU* component usually becomes increasingly degraded to a less beneficial order as it moves through the system. There are three main ways in which *QU* is degraded or lost:

1. *Natural degradation* – natural processes (such as oxidation, reduction, or decomposition) facilitate the degradation of the gradient in *QU* between a resource and its surroundings.

2. *Degradation from pollution* – A degrading substance - such as certain waste materials - with a *negative QU* (see below) interacts with a resource, causing an acceleration in the degradation of the *QU* of the resource.

3. C*onsumption* – The *QU* incorporated in a resource is consumed by man or another living entity. After some or all of the *QU* is consumed, the degraded matter and energy is often released back into its environment as 'waste'.

Natural degradation of *QU*

While matter and energy are indestructible, there is a natural and ongoing degradation of *QU*, over time. The rate and extent of this degradation varies, depending on the type of matter and energy, the type and extent of *QU*, and the environmental conditions surrounding the resource, such as temperature, light, and the chemical makeup of the environment, as well as biological factors, as described below.

The role of biological factors in the natural degradation of *QU*

Biological factors are particularly important in the natural degradation of *QU*[332]. As Miller writes: *"All forms of life are tiny pockets of order (low entropy) maintained by creating a sea of disorder*

[331] Cleveland (2007), pp 17-18.

[332] It is important to note that biological degradation may have a positive effect or a negative effect, relative to the wellbeing of man. Negative effects include various diseases that result from infection by pathogens that degrade the beneficial order or *QU* incorporated in living tissues and organs of humans, or other living beings that provide benefit for man. Positive effects include the actions of certain insects and microorganisms known as *decomposers* that derive their nourishment from the degradation of dead organic matter. Decomposers play a vital role in the ecosystem, neutralizing harmful materials (such as naturally occurring, or some human-produced toxins), promoting the cycling of matter, particularly mineral matter, and transforming the matter from an organic state back to a mineral state where it is more available to plants and many other living organisms. For example, dead leaves falling on a forest floor are broken down – by the decomposers in the soil – into the raw materials from which the leaves were made. As a result of this decomposition, carbon dioxide is released back into the atmosphere, where it can be reused by growing vegetation. Minerals such as nitrogen, phosphorous and potassium are released back into the soil – where they become

(high entropy) in their environment[333]*."* In other words, all living beings maintain their life at the expense of their surrounding environment, which they degrade by withdrawing from their environment relatively high quality material (resources - usually in the form of food and water) and expelling back into the environment lower quality material (usually in the form of wastes).

Pollution and *negative QU*

Environmental pollution is often a byproduct of human interaction with the environment. One of the negative effects of environmental pollution is the additional and accelerated degradation of the *QU* in natural resources. For example, untreated industrial effluents discharged into a body of clean water cause the accelerated degradation of the *QU* of the water, by making it less pure and less beneficial for most human uses[334].

In a similar vein, Partha Dasgupta writes[335]: *environmental pollutants are the reverse side of natural resources. In some cases the emission of pollutants amounts directly to a degradation of eco-systems… Roughly speaking, 'resources' are 'goods', while 'pollutants' (the degraders of resources) are 'bads'. In this sense, pollution is the reverse of conservation.*

Just as *QU* is a resource, pollution can be looked at as *negative QU*. Pollution, or *negative QU* causes or accelerates the degradation of the *QU* of resources. To use the above example of untreated industrial effluents, which degrade the *QU* of a receiving body of clean water – the effluents can be treated (for example in a water-treatment facility) where the addition of *QU* (in the form of energy and other resources to operate the facility) will neutralize the *negative QU* of the effluents[336].

Consumption and man's role in the loss and degradation of *QU*

When man uses resources, he consumes the *QU* incorporated in the matter and energy making up the resource. Man gains benefit from this consumption by satisfying his needs and wants. In the process, the matter and energy, minus the *QU* consumed by man, is often released back into the environment as wastes.

Of all living organisms, man is unmatched in his ability to consume and otherwise cause the degradation of material resources. Man's technological innovations, particularly since the industrial revolution, have greatly amplified his capacities to utilize and cause the degradation of material resources – including many resources that were unavailable in earlier times, such as plastics and synthetic pesticides. On the other hand, some technological innovations have had a favorable effect on resource management by facilitating greater efficiency in the use of resources,

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available once again to the roots of plants, or to other organisms living in the soil. This decomposition is usually an acceleration of the degradation of materials that are already undergoing non-biological degradation.

[333] Miller, p.84. Miller is apparently echoing Nobel laureate physicist Erwin Schrödinger (*What is Life*?, 1944), who wrote: *Thus the device by which an organism maintains itself stationary at a fairly high level of orderliness (= fairly low level of entropy) really consists of continually sucking orderliness from its environment*.

[334] There are exceptions to this generalization. For example, some effluents, such as nitrates and phosphates, in limited quantities, can enrich some bodies of water, and increase their productivity for man.

[335] Partha Dasgupta, *Human Well-Being and the Natural Environment*, (Oxford, 2001) pp.124-125.

[336] It is important to note that biological decomposition can often neutralize some of the negative *QU* of effluents. Certain microorganisms are able to break down materials in effluents, and utilize these materials in their own metabolism to neutralize what for humans was considered *negative QU*. This process is sometimes referred to as *bioremediation* (see for example, Miller, p.580).

or in some cases, improvements in the resources themselves, as will be discussed later in this chapter.

C. The production of *QU*

Given that the earth's ecosystem is described as a 'closed system', in which *QU* is constantly being degraded, it might appear that everything in this system should be inevitably degrading towards dissolution and chaos. And yet this is not necessarily so. In many cases, the opposite process – movement away from degradation and toward greater organization and higher *QU* is occurring. The processes of life itself appear to work against the degradation described above.

QU can also be produced and incorporated into matter and energy, in processes that are highly *energy-dependent*. Energy is required to structure, organize, purify, and/or transport the matter and energy in a form and to a location in which it can provide more benefit to man. Economist Julian Simon expresses the energy-dependency of adding what I am calling *QU* to matter and energy as follows[337], *Energy is the master resource, because energy enables us to convert one material into another*[338]*. As natural scientists continue to learn more about the transformation of material from one form to another with the aid of energy, energy will be even more important. Therefore, if the cost of usable energy is low enough, all other important resources can be made plentiful…*

Even though energy plays a vital role in resource management, Simon seems to overlook other important natural resources such as living organisms (including both domesticated livestock and non-domesticated plants and animals), as well as time and land[339], which cannot necessarily be made plentiful by abundant and inexpensive energy. As will be discussed below in section 4.3.4, Simon's calculus is dependent more on *knowledge* than on energy. Without the development of the necessary knowledge, additional energy at any cost will be insufficient to make many other important resources plentiful.*QU* can be incorporated into matter and energy by natural processes or by man-made processes, both of which will be discussed below.

Natural process for producing and increasing *QU*

Natural processes provide many life-supporting or otherwise beneficial services to man, from the production of oxygen and food (through photosynthesis) to the filtering of water and air and the cycling of nutrients. In all of these processes, the natural world incorporates *QU* into matter already present in the environment. Virtually all of these processes are powered by the sun[340].

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[337] Julian Simon, *The Ultimate Resource* 2 (Princeton, 1996), p.162.

[338] It is not completely clear what Simon means by "convert one material into another". Similarly, in another location (page 63 of *The Ultimate Resource*), Simon suggests "the possibility of creating copper or its economic equivalent from other materials". Biologist Paul Ehrlich criticizes Simon for asserting that "humanity could convert the entire universe into copper!" (see "Simple Simon Environmental Analysis", in Miller, p. 28). It is reasonable to assume that Simon is referring instead to creating new materials such as alloys from other, existing materials.

[339] Productive land is a limited commodity, for which there are usually a number of competing uses. As the human population and living standards increase, the pressure on productive land also increases regardless of energy prices. On the other hand, Simon does make the point that low energy prices would enable to people to reclaim currently unused desert land for agriculture by making desalination less expensive, which to a limited extent could increase the amount of productive land (see Simon, 1996, p.162).

[340] One possible exception is the recent discovery of deep sea vents and the amazing variety of living organisms that they support – seemingly without any influence from the sun (see for example: http://www.resa.net/nasa/ocean_hydrothermal.htm#community). This may not be an exception, however, since it is

Man-made processes for producing or adding *QU* to matter and energy

Almost all industrial and agricultural activities involve adding *QU* to matter and energy to make it more beneficial to man. For example, Womack and Jones describe the production of aluminum beverage cans from raw material as follows[341]: *Bauxite is mined in Australia and trucked to a chemical reduction mill where a half-hour process purifies each ton of bauxite into a half ton of aluminum oxide. When enough of that is stockpiled, it is loaded on a giant ore carrier and sent to Sweden or Norway, where hydroelectric dams provide cheap electricity…The smelter takes two hours to turn each half ton of aluminum oxide into a quarter ton of aluminum metal, in ingots ten meters long. These are cured for two weeks before being shipped to roller mills in Sweden or Germany. There each ingot is heated to nearly nine hundred degrees Fahrenheit and rolled down to a thickness of an eighth of an inch. The resulting sheets are wrapped in ten-ton coils and transported to a warehouse, and then to a cold rolling mill in the same or another country, where they are rolled tenfold thinner, ready for fabrication. The aluminum is then sent to England, where sheets are punched and formed into cans, which are then washed, dried, painted with a base coat, and then painted again with specific product information. The cans are next lacquered, flanged (they are still topless), sprayed inside with a protective coating to prevent the cola from corroding the can, and inspected.* Each of the steps described above, in which *QU* is incorporated into matter, requires the input of energy.

While natural processes for incorporating *QU* into matter have changed little over the human scale of time (in the thousands of years), man-made processes have significantly evolved. This evolution includes a transition from human or animal-powered labor to an increasing reliance on mechanization powered by the energy harnessed from moving water (hydropower) or released by the combustion of wood, fossil fuels (such as coal, oil, and natural gas) or by nuclear power. This mechanization has greatly increased man's capacity to incorporate *QU* into focused areas of matter and energy, but, usually at the cost of increasing the overall degradation of the planet's environment.

Pathways for increasing *QU*

There are two primary pathways for the input of energy required to increase *QU*. The first pathway is through consuming the energy contained in non renewable resources within the earth's closed system. For example, the energy can be produced by burning fossil fuels[342]. Obtaining energy in this way is essentially transferring energy from one location within the system to another – which can cause an increase in *QU* in one location (where the energy is being used to produce *QU*) at the expense of a decrease of *QU* in other locations (such as the sites from which the fuel sources were extracted, transported, refined and combusted), and a probable overall decrease of what I am calling *QU* within the earth's closed system[343]. Most of the available energy produced is inadvertently degraded to lower *QU* heat energy which man doesn't utilize. For example, a shoe

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possible that without the dissolved oxygen (originally produced by photosynthesizing organisms) present in the water, even at great depths, some of these organisms would not survive.

[341] Womack, J. P., and Jones, D. T., 1996, "Beyond Toyota: How to Root Out Waste and Pursue Perfection," *Harvard Business Review*, (Sept./Oct. 1996).

[342] Fossil fuels such as oil or coal are believed to have originated from plants and animals that lived and died long ago and themselves took energy from the sun. Therefore, the energy contained in these fossil fuels can be considered to have also originated from the sun. The difference is that the process of producing these fossil fuels in such a way takes place very slowly and for all practical purposes is considered to be non-renewable in the human scale of time.

[343] This may be related to the effects of the second law of thermodynamics described above in section 4.1.3, although *QU*, as I am describing it, is too vaguely-defined of a concept to place within the limits of the second law.

factory produces shoes from raw materials such as leather, rubber, metal, plastics and glue. The factory adds *QU* to the raw materials, and man consumes and benefits from the finished product – shoes – more than he might have from consuming the raw materials alone. In doing so, however, the factory consumes energy quality and other resources taken from other locations, and produces waste materials (including waste heat) which may find their way into the environment, causing pollution, which further degrades resources. Alternatively, the waste materials may be properly treated, so as to prevent environmental pollution, but this will require additional energy quality from within the earth's ecosystem. The overall effect may be environmental degradation, and may result in a net loss of *QU* within the earth's ecosystem.

The second pathway to increase *QU* is through the direct utilization of energy from a source *outside* the earth's ecosystem[344]. Since the energy is imported from outside the system, it is possible to increase the *QU* in a given location without causing a net decrease in *QU* within the earth's ecosystem. Not only is it possible to avoid a net decrease in *QU*, but through importing energy from outside, there can be an overall increase in *QU* within the earth's ecosystem. This ability to increase the overall *QU* within the earth's ecosystem is obviously of great importance in the management of natural resources – which I have already described as the management of the *QU* incorporated in these resources.

Means for importing energy into the earth's ecosystem

The physical source of imported energy is the sun. The primary natural means for 'importing' this energy in order to obtain a net increase in the level of *QU* within the earth's ecosystem is through the process of *photosynthesis*. Photosynthesizers – primarily green plants, phytoplankton, and certain bacteria – are able to import (actually to utilize what is already there but otherwise unavailable) some of the radiant energy received from the sun that is not otherwise utilized. Photosynthesizers transform this sunlight, along with other relatively low quality matter – such as atmospheric carbon dioxide and soil-bound minerals and water – into high quality chemical energy (glucose), as well as oxygen and biomass (plant material that provides food, fiber and fuel for man). The process of photosynthesis is summarized in the following equation:

$$6CO_2 \text{ (carbon dioxide)} + 12H_2O \text{ (water)} + \text{energy (photo energy from the sun)} \rightarrow C_6H_{12}O_6 \text{ (glucose = chemical energy)} + 6O_2 \text{ (oxygen)} + 6H_2O \text{ (water)}$$

The products of photosynthesis (chemical energy, oxygen, and organic matter-biomass) provide the basis for most other forms of life on the planet. In other words, photosynthesizers transform relatively low quality energy and matter into higher quality *resources* that are vital for life; providing the basis of a life-support system for other living organisms on the planet including man. It should be noted that there are other means by which the sun's energy is utilized to increase the net *QU* within the earth's ecosystem, one of which is the natural purification and redistribution of water (as will be discussed in chapter 6).

[344] The source of the energy necessary for counteracting natural degradation within the earth's closed system (in which energy can leave and enter from outside the system but matter cannot, as described above in section 4.2.1) is the sun, which provides the constant flow of energy necessary for life. While the suns energy warms the planet, it cannot be used *directly* as a source of energy by most living beings (with the exception of the photosynthesizers as described below). The sun was also the source of the energy contained in fossil fuels such as coal, oil and natural gas – which are thought to originate from decomposed plant and animal matter that became buried beneath the earth's surface.

The net production of *QU*

As discussed above, while *QU* is constantly being consumed or degraded, additional *QU* can also be produced. Production of *QU* through the first pathway (for example, the combustion of fossil fuels) adds *QU* in a specific location by drawing it from other locations – and resulting in a net loss of *QU* within the earth's ecosystem. Production of *QU* by the second pathway – through the photosynthesizers – can produce a net gain in *QU*, and therefore, a net gain in the resources available to man. In ecological terminology, the photosynthesizers are referred to as *producers*, and they play a primary role in determining the net productivity of an ecosystem.

Carl Folke writes[345]: *Solar energy is the driving force of ecosystems, enabling the cyclic use of water, materials and compounds required for system organization and maintenance. The ability of plants in terrestrial ecosystems and plants and algae in aquatic ecosystems to fix solar energy (photosynthesis) is a prerequisite for biological organization. They are called primary producers. All animals [and man] are dependent on the ability of primary producers to fix solar energy*.

The term *productive capacity* (*PC*) will henceforth be used to represent the capacity of producers to produce net *QU* (to produce *QU* in excess of what the producers need for their own maintenance and growth). The *PC* of photosynthesizers is commonly expressed in terms of *net primary production*, which Miller describes as follows[346]: *The rate at which an ecosystem's producers convert solar energy into chemical energy as biomass is the ecosystem's gross primary production (GPP). Net primary production (NPP) is what is left after using what is needed for the producers themselves. It is the rate at which energy for use by consumers [man and animals] is stored in new biomass – cells, leaves, roots, stems.*

Aside from *PC* described above as the net primary production of photosynthesizers, I am defining *PC* to include any net production of *QU* in the earth's ecosystem, such as the purification of water through natural processes. *PC* is a crucial element in counteracting the loss of *QU* in the environment. The greater the degradation or consumption of *QU*, the greater the *PC* needed to compensate and prevent the loss of natural resources, and to prevent the resulting decrease in the wellbeing of man. A net increase in *PC* is essential in allowing mankind to progress in a sustainable way, as will be discussed below.

The earth's ecosystem as a producer and provider of *QU*

The first ever global inventory of natural resources - the Millenium Ecosystem Assessment (MA) was commissioned by the United Nations in the year 2000 and documented in early 2005, with the release of the MA report. This report defines an *ecosystem* as a *dynamic complex of plant, animal, and micro-organism communities and the nonliving environment interacting as a functional unit*[347]. Each ecosystem produces *ecosystem services* which the MA report defines as the *benefits* that people obtain from the earth's ecosystems[348]. These ecosystem services provide the basic life support that man needs to survive on the planet. The MA report groups the earth's ecosystem services into the following four categories[349]:

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[345] Carl Folke, "Ecological Principles and Environmental Economic Analysis," *Handbook of Environmental and Resource Economics*, ed. Jeroen C.J.M. van der Bergh, (Cheltenham, 1999), pp. 895-911.
[346] Miller (1998), p.10.
[347] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington D.C., 2005), Preface, p.vii.
[348] Ibid, p.V.
[349] Ibid.

- *Supporting services* – such as nutrient cycling, soil formation and primary production (photosynthesis).
- *Provisioning services* such as food, water, timber, fuel
- *Regulation services* – such as climate regulation, flood regulation, disease regulation and water purification
- *Cultural services* – such as aesthetic, spiritual, education and recreational

The ecosystem services in the first three of these categories provide the basic *benefits* that man requires to survive in this world. The *provisioning services*, as described here, provide direct benefit for man, in that man directly consumes the *QU* (in the form of food, water and fuel, etc.) that these services provide. The *supporting* and *regulation services* provide indirect benefits such as the availability of soil for growing crops and the presence of beneficial climatic conditions. Man also benefits from what the MA report calls 'cultural services' although they are not, in my opinion, critical for his physical survival. Within my nomenclature, the producers of all of these ecosystem services can be included within what I am calling *PC*. Each producer has the capacity to produce *QU*, or beneficial order, which satisfies the needs and wants of man.

According to the M.A. report[350]: *Changes in ecosystem services influence all components of human well-being, including the basic material needs for a good life, health, good social relations, security, and freedom of choice and action. Humans are fully dependent on Earth's ecosystems and the services that they provide, such as food, clean water, disease regulation, climate regulation, spiritual fulfillment, and aesthetic enjoyment. The relationship between ecosystem services and human well-being is mediated by access to manufactured, human, and social capital. Human well-being depends on ecosystem services but also on the supply and quality of social capital, technology, and institutions. These factors mediate the relationship between ecosystem services and human well-being in ways that remain contested and incompletely understood. The relationship between human wellbeing and ecosystem services is not linear. When an ecosystem service is abundant relative to the demand, a marginal increase in ecosystem services generally contributes only slightly to human well-being (or may even diminish it). But when the service is relatively scarce, a small decrease can substantially reduce human well-being.*

Having described the concept of *QU*, as an explanatory tool, to help describe the principle of *bal tashchit* in ecological and economic terms, the next step is to see how this concept fits in with the principle of *bal tashchit* in the Jewish sources.

[350] Ibid, p.49.

4.2 The integration of *QU* with *bal tashchit* – a look at the Jewish sources

The Biblical source for the principle of *bal tashchit* (Deuteronomy 20:19-20) places a particular emphasis on fruit-producing trees and their relationship to man. In chapter two, I proposed that *trees* symbolize (in the Jewish tradition) the *natural life support system for man*, as well as *progressive growth and development* and the *highly-developed human being*. I will now employ the concept of *QU*, as introduced earlier in this chapter to help further develop the relationships between *bal tashchit*, fruit-producing trees and man. While much of this explanation is speculative in nature, I suggest that it will be valuable in providing a deeper philosophical understanding of the principle of *bal tashchit* and the Jewish sources upon which it is based.

4.2.1 Fruit-producing trees as representative of *PC* (producers of *QU*)

Section 4.1 discussed how resource management can be described as the management of *QU*, and how the producers play a critical role in the production of *QU* in the ecosystem or life-support system for man. One might, therefore, expect to find a special reference to the producers in the principle of *bal tashchit* – the basis for a Jewish perspective on resource management. Deuteronomy 20:19-20, however, appears to be limited to fruit-producing trees – only one of almost countless types of photosynthesizing organisms, which are only one part of the providers of ecosystem services vital to man.

As discussed above, fruit-producing trees, in the Jewish tradition, symbolize mans life-support system in this world. This includes, in my opinion, all *producers* of *QU* for man, including the ecosystem services described above in the M.A. report. This speculation is not as strange as it may initially seem. The Jewish sources sometimes subsume a group of related objects under a single principle object which represents the entire set of objects in the manner in which they are related[351]. For example, in the Hebrew language, the word for bread is *lechem*. Bread is considered (in the Jewish tradition) to be the principle food for man[352]. While the word *lechem* can refer specifically to bread, it is often used in a general sense to include all types of nourishment for humans, including both vegetative and non-vegetative foods[353]. In other words, *lechem* describes everything that fulfills the function of nourishing a human being. In a similar way, I suggest that the concept of *fruit-producing tree* can be used in a more general sense to include not only all photosynthesizers, but even, other *producers of benefit (PC) for man*. Section 2.2.1, which discusses how trees represent the natural life-support system for man, gives support for this idea[354]. The producers of *QU*, understood here in their broadest sense, form the basis of man's life support system on earth. This includes all of the interrelated systems which produce and provide benefits to man, including the hydrological system, which produces clean water, and the climatic system which produces a livable climate for man, (both of which I will discuss in chapter 6).

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[351] This is similar to the Latin concept of *pars pro toto.*

[352] BT Berachot 49a: commentary of Rabbeinu Asher (Rosh) 7:23, p. 33; R. Jacob ben Asher, *Tur* (Tel Aviv, 1999): Commentary of R. Yosef Caro, *Beit Yosef*, Orach Chayim 188:7, vol. 2, p. 250, 639:3,5, vol. 5, p. 537.

[353] *Peirushei Rashi al haTorah*, ed. Haim Dov Chavel (Jerusalem, 1983), p.327, on Levit. 3:11; *Mikraot Gedolot: Neviim Ketuvim*: (Jerusalem, 1990), vol. 2, *Neviim Achronim: Metzudat Tzion*, Jerem. 11:19, p. 114, Leviticus 3:11: commentary of Rashi; Metzudat Tzion on Yermiyahu 11:19; Sefer HaChinuch, Mitzvah 275. It is interesting to note that in the Arabic language, *lchem* is the word for meat, but can also mean other foods.

[354] This is, of course, knowledge dependent. I am proposing that in using trees to symbolize the life-support system for man, this is meant to include everything in nature that provides life support services, including those things that will only be later discovered by man as his knowledge of the natural world increases.

As described in the summary of the previous chapter, the focus of the Biblical prohibition of *bal tashchit* is on the protection of fruit-producing trees, which produce a stream of benefits for man. This protection is so important that is expressed in the form of at least one Biblical commandment, and according to some opinions, two or even three Biblical commandments (see section 3.2.2.2). Additional protection results from the aspect of danger involved in the destruction of a fruit-producing tree, which has even more force than a prohibition (see section 3.2.2.3).

I can now suggest two collateral explanations for the 'metaphysical' warnings against destroying fruit-producing trees that were discussed in section 3.2.2.3 of the previous chapter. The first explanation addresses the irrational nature of these warnings.
Expressing the warning in terms of a *danger*, and in such a non-rational way gave, *de facto*, significantly greater protection to these trees. Once there is a rational understanding of a prohibition, or even of a danger, people can sometimes find ways of doing the prohibited or dangerous act while avoiding those details which they understand will bring about the penalty or danger. If there is no rational understanding, and if the danger is sufficiently threatening, then the prohibition must be respected in all circumstances.

The second explanation takes a more rational approach. I suggest that the Jewish scholars were emphasizing that productive trees, as part of our life support system in this world, provide benefit for all. Those that destroy these trees are in effect cutting off part of the branch that supports all of us, which is a dangerous act. The scholars wanted us to be aware of and sensitive to the negative consequences resulting from this type of behavior.

4.2.2 Fruits as representative of resources, or carriers of *QU*

If fruit-producing trees symbolize the producers of *QU*, then the products that these trees produce – the *fruits* – should bear a close relationship to the concept of *QU*. Indeed, the concept of fruits in the Jewish sources is remarkably similar to the concept of *QU* discussed above. Fruits represent natural resources (*QU* incorporated into matter or energy) which man consumes to satisfy his needs and wants.

As discussed in section 3.5, the *fruits* are given less protection by *bal tashchit* than the producers. The focus of this protection is on the *value* of the *QU* to man, or the value of the benefits man derives from the object, rather than the object itself. The object can be destroyed if the value or benefits derived though this destruction are greater than if the object is not destroyed. Also, while protecting fruit-producing trees is clearly a Biblically derived, and therefore, more stringent requirement, protecting non-producers is, according to some opinions, Rabbinically-derived, and less stringent.

4.2.3 Fruit-producing trees as representative of man as a producer of *QU*

Section 2.2.3 describes how fruit-producing trees symbolize the *developed and elevated individual* – epitomized by the Tzaddik/Torah Scholar in Jewish tradition – who produces benefit for humanity and for the entire world. Like a fruit-producing tree, all of humanity has the potential for increasing the *QU* within the earth's ecosystem[355]. Man is gifted with a remarkably high level of intelligence, relative to other life on the planet. This intelligence may, in some cases – as will be

[355] This can include any individuals that produce benefit for mankind and the world. For example, R. Yisrael Lifshitz referred to originators of useful inventions that benefit mankind as "חסידי אומות העולם" – *righteous ones of the nations of the world* (commentary on Mishna Avot 3:14, see section 5.2.2.4).

discussed below – enable man to counteract the degradation of *QU*. Through proper application of man's intelligence he may even be able to increase the *QU* within the earth's ecosystem. For example, man is able to creatively innovate and develop more efficient ways of growing food and producing goods and services. These increases in efficiency allow man to produce more *QU* with less consumption of energy and other resources, and with less waste.

Man's ability to counteract or reverse *degradation* has been expressed before. For example, mathematician Norbert Weiner's writes[356]: *Man is the ultimate antientropy*. Similarly, inventor R. Buckminster Fuller writes[357]: *You and I are essential functions of the Universe. We are exquisite antientropy*. Elsewhere, Fuller writes[358]: *Man's function in universe is that of the metaphysical, anti-entropic function. He is essential to the conservation of universe which is in itself an intellectual conception. In 1951 I published my conclusion that man is the anti-entropy of universe. Norbert Weiner published the same statement at the same time. Both of us arrived at our conclusions by different routes and without knowledge of the other's discovery.*

An earlier, less direct expression of man's potential role in countering degradation may be suggested in the work of physicist James Clerk Maxwell. In 1871, Maxwell published a thought experiment in which he attempted to prove an exception to the second law of thermodynamics. Maxwell wrote[359]: *... if we conceive of a being whose faculties are so sharpened that he can follow every molecule in its course, such a being, whose attributes are as essentially finite as our own, would be able to do what is impossible to us. For we have seen that molecules in a vessel full of air at uniform temperature are moving with velocities by no means uniform, though the mean velocity of any great number of them, arbitrarily selected, is almost exactly uniform. Now let us suppose that such a vessel is divided into two portions, A and B, by a division in which there is a small hole, and that a being, who can see the individual molecules, opens and closes this hole [with a frictionless door], so as to allow only the swifter molecules to pass from A to B, and only the slower molecules to pass from B to A. He will thus, without expenditure of work, raise the temperature of B and lower that of A, in contradiction to the second law of thermodynamics*.

The intelligent being of Maxwell's thought experiment was dubbed 'Maxwell's demon'. It was later established that while the intelligent being might be able to decrease the entropy within the system (vessel) this would be compensated by an increase in the overall entropy of the universe because of the energy that would have to be consumed in order to obtain the necessary information about the position and speed of the molecules within the vessel[360].

In effect, man duplicates the actions of Maxwell's intelligent being. With sufficient knowledge, man can reverse the effects of entropy (degradation) within a closed system. This does not violate the second law of thermodynamics, because producing or obtaining the knowledge requires the

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[356] Richard F. Ramsay, unpublished paper, available at: http://www.fsw.ucalgary.ca/ramsay/papers/is-social-work-a-profession.htm.

[357] R. Buckminster Fuller, "How Little I Know," *Saturday Review* (November 12, 1970), p. 70.

[358] R. Buckminster Fuller, *Comprehensive Design Structure, Phase II* (1967), Part 5, p.23; available at: http://www.bfi.org/files/pdfs/dsd/WDSD_PhaseII_Doc5_DS.pdf

[359] James Clerk Maxwell, *Theory of Heat* (New York, 1872), pp.308-309 (taken from facsimile edition published by AMS Press, 1972, and available at: http://www.web.lemonyne.edu/~GIUNTA/demon.html).

[360] For example, Charles Seife, in his book *Decoding the Universe* (New York, 2006), pp.78-79 describes how physicist Leo Szilard solved the paradox of 'Maxwell's demon' by proving that: *the process of obtaining and acting upon that information [the information necessary to measure the speed and position of an incoming molecule] increases the universe's entropy, counteracting the demons efforts to decrease the entropy of the box by kT log 2 joules*[where *T* is the absolute temperature of the room that the demon is in and *k* is the Boltzmann constant] *for every bit of information it obtains and acts upon*.

consumption of energy from somewhere. If this energy comes from a renewable source, such as solar energy, it need not increase the entropy within the earth's ecosystem. Any increase in the overall entropy of the entire universe would be, it would seem, infinitesimal in the larger scheme of things.

Distinction between material and non-material *QU*

Up to this point, the discussion on *QU* has focused on material resources. Since the principle of *bal tashchit*, as described in section 4.1, aims to maximize the well-being of man through the optimal management of that which brings benefit to man, it is helpful to introduce another concept which I will call *non-material QU*.

For purposes of brevity, *non-material QU* will be referred to as *NQU*, and the *QU* incorporated into matter and energy will herein be referred to as *material QU* or *MQU*. The capacity of an object or system to produce *MQU* will be referred to as *material productive capacity (MPC)*. The capacity of man to produce *NQU* will be referred to as *non-material productive capacity (NPC).*

Knowledge as a form of *NQU* – I have already discussed how energy plays a critical role in the production of *QU*. A second critical factor in the production of *QU* is *knowledge*[361]. I will define knowledge as *information that is ordered in a way* which helps bring benefit to man, by satisfying his needs and wants, and which can be stored, transmitted and built upon for the benefit of man.

This definition of knowledge is similar to the way I described *QU* as matter or energy that is structured or ordered in a way that brings benefit to man. As with matter and energy, it is the way the information is *ordered* that determines its value. R. Hirsch brings what appears to be a similar idea, with moral overtones, by describing the process of thinking (מחשבה) as a process of 'weaving' (חושב) together or ordering what we might call 'information' into thoughts and ideas[362]: *Our soul is a* חושב a *weaver, the material is given to it. As the raw material, all possibilities, good and bad, lie in its hands. The soul has to weave them together to form them into shapes,* צורות*, i.e. our thoughts our ideas, and these* צורות *are* יצר*, the formations of our weaving soul. Out of the material given us we can make whatever we like. But at the same time God has given us the "pattern" according to which we are to weave. If we do this then it is altogether good. The* חושב *is not to leave out, cannot spare, any thread, any color. In its appointed place and used in its prescribed way, everything is good.* יצר*, the idea, the picture of what we can achieve, certainly does urge, "tempt" us to achieve it, but we ourselves have formed it. If this idea (*יצר *literally in Greek 'Ιδέχ that which is formed, a picture) is a good one, then we strive for the good, and also the reverse is true.*

As R. Hirsch describes, there are a myriad of possible permutations in which to *order* information, and the way we weave together or *order* information into thoughts and ideas determines our behavior. Rather than 'working from scratch', R. Hirsch writes that God has given us the "pattern" or proper permutation of order of information (through the Torah). The 'moral overtones' are further discussed below in the discussion of 'righteousness'.

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[361] What I am calling 'knowledge' or 'ordered information' is also necessary for producing *MPC* and *MQU*. I am referring here to the genetic information coded into every living being which determines the arrangement or order of matter and energy from which every physical being is made.

[362] Hirsch Pentateuch, Genesis, p.131.

The crucial role of knowledge in resource management

While both knowledge and energy are necessary for producing *QU,* knowledge plays an even more important role in the management of natural resources than energy. First of all, knowledge is required to properly develop and utilize potential energy sources. Secondly, while energy is subject to degradation, and its utilization is limited (by the current level of knowledge), knowledge itself is cumulative and not subject to degradation. Simon[363] cites physicist Frank Tipler who: *argues, on the basis of the established body of contemporary knowledge of physics, that the ultimate constraint [on the survival of man in this world] is not energy, but rather information. Because we can increase the stock of information without limit, there is no need to consider our existence finite.* By 'information', Tipler is apparently referring to what I am calling *NQU* in the form of *knowledge*. Only information that is properly ordered into useful knowledge can help insure man's survival.

An additional advantage of knowledge is that it is, apparently, not subject to diminishing returns. *MQU,* on the other hand, is subject to diminishing returns, in that once his basic needs are met, there is a diminishing marginal benefit to man from additional inputs of *MQU.* Along these lines, Marshall writes[364]: *although nature is subject to diminishing returns, man is subject to increasing returns ... Knowledge is the most powerful engine of production; it enables us to subdue nature and satisfy our wants*. Similarly, J.M. Clark observes that[365]: *knowledge is the only instrument of production that is not subject to diminishing returns.* Jesse Ausubel writes[366]: *Knowledge, not more cropland or more timberland, is what now grows productivity*[367]. Finally, unlike *MQU,* knowledge can be completely utilized, apparently, without creating waste products.

According to the M.A. report[368]*: The development and diffusion of scientific knowledge and technologies that exploit that knowledge has profound implications for ecological systems and human wellbeing. The twentieth century saw tremendous advances in understanding how the world works physically, chemically, biologically, and socially and in the applications of that knowledge to human endeavors. Science and technology are estimated to have accounted for more than one third of total GDP growth in the United States from 1929 to the early 1980s, and for 16–47% of GDP growth in selected OECD countries in 1960–95.The impact of science and technology on ecosystem services is most evident in the case of food production. Much of the increase in agricultural output over the past 40 years has come from an increase in yields per hectare rather than an expansion of area under cultivation. For instance, wheat yields rose 208%, rice yields rose 109%, and maize yields rose 157% in the past 40 years in developing countries. At the same time, technological advances can also lead to the degradation of ecosystem services. Advances in fishing technologies, for example, have contributed significantly to the depletion of marine fish stocks.*

The knowledge I am referring to as *NQU* is not restricted to the conventional realms of science or technology. There are other types of knowledge that play an important role in resource

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[363] Julian Simon, *The Ultimate Resource 2*, (Princeton, 1996), p.65.
[364] Alfred Marshall, *Principles of Economics: An Introductory Volume* (New York, 1948), available at: http://www.econlib.org/library/Marshall/marP15.html.
[365] Clark, J.M, *Studies in the Economics of Overhead Costs*, (Chicago, 1923), p. 120.
[366] Jesse H. Ausubel, "Resources are Elastic", *Earth Matters* (Winter 1999/2000), pp. 46-47.
[367] This must be understood in context. Knowledge by itself only grows productivity when combined with the necessary physical resources (*MQU*). What Ausubel and others are expressing is that with the necessary physical resources available, knowledge plays a more important role than these resources.
[368] MA report (2005), pp.66-67.

management. For example, according to the M.A. report[369], the *Effective management of ecosystems typically requires "place-based" knowledge – that is, information about the specific characteristics and history of an ecosystem. Traditional knowledge or practitioners' knowledge held by local resource managers can often be of considerable value in resource management, but it is too rarely incorporated into decision-making processes and indeed is often inappropriately dismissed.*

The production of *NQU*

While *NQU* itself is not something material, the production and management of *NQU* requires the investment of material resources. For example, the process of education as well as research and development require the investment of material resources (for the upkeep of those studying and doing research, overhead costs, etc.) before any *NQU* is created. Man – the producer and manager of *NQU* – requires *MQU* to meet his basic needs and wants, and to develop his intellect in order to produce *NQU*. The prerequisites for producing *NPC* include[370]:

1. Providing sufficient *MQU* to satisfy the basic needs of the population.
2. The availability of surplus *MQU* (beyond that required for meeting basic needs) to invest into *NPC* (such as education and research and development).
3. Proper educational system.

These prerequisites will be discussed in more detail in the following chapter.

Cleveland and Stern sum up the importance of knowledge in the production of *QU* (expressed here in terms of industrial production, through which *MQU* is added to raw materials to increase their utility for man). They also express how producing this knowledge requires the investment of material resources, as follows[371]: *Low-entropy energy and matter are not the only non-reproducible inputs to production. According to Stern, information could be seen in an analogous way to energy as a primary input. This information is accumulated as knowledge. Technology consists of the designs for the products to be manufactured, the ideas for which come in part from human imagination, and the techniques used in producing those products. These techniques consist purely of the application of the knowledge of physical laws and the chemical and biological properties of resources to the production process, though of course the techniques used at any one time are contingent on the path of knowledge accumulation to that date. This latter knowledge is the result of the extraction of information from the environment. Capital, labour and energy are required to extract that knowledge from the environment and render it into a productive form. Capital, labour and other intermediate goods are produced within the economy by applying to matter the two primary factors of production: low-entropy energy and knowledge.*

[369] Ibid, p.24.
[370] I have not listed here two additional conditions for producing *NQU*: a 'critical mass' of population with free time to study to increase their knowledge and a 'critical mass' of accumulated knowledge. By 'critical mass' I mean sufficient quantity and quality (people with intellectual ability to learn, assimilate and produce new knowledge, and knowledge that is sufficiently accurate and understandable as to be built upon). The need for these is well recognized. I omitted these because, in my opinion, they are not directly related to our discussion.
[371] Cutler J. Cleveland and David I. Stern, "Indicators of natural resource scarcity: a review and synthesis", *Handbook of Environmental and Resource Economics*, ed. Jeroen C.J.M. van der Bergh, (Cheltenham, 1999), p.101.

Improperly applied knowledge

While knowledge may give man the ability to counteract the *degradation* of *MQU* – at least on the level of his local environment – there is no denying that humans often play the opposite role, as a destructive force in the environment. Many human interactions with the environment seem to have an overall negative effect on the *MQU* of the natural resources in the environment. The difference therefore, between whether man increases or degrades the *quality* of the environment seems to be *how* human intelligence is applied in relation to the management of the world's resources. Humans, it would seem, can be either an asset or a debit in relation to the *QU* of natural resources.

For example, in the aftermath of the Second World War, the United States economy – which had been running at high capacity for producing war materials – faced a slowdown. As the economy shifted from the production of war materials to the production of consumer goods, a concerted effort was made to raise the level of consumption and consumerism in the U.S. to increase the demand for consumer goods. This effort is exemplified in the words of marketing analyst Victor Lebow[372]: *Our enormously productive economy… demands that we make consumption our way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfaction, our ego satisfaction, in consumption… We need things consumed, burned up, worn out, replaced, and discarded at an ever increasing rate.*

Lebow's quote illustrates what I would call the application of knowledge for wasteful purposes[373]. The increased material consumption and degradation that he helped promote, while fueling short-term economic growth, had a negative long term effect on the quality of man's life-support system, the natural environment. His quote also characterized the growing influence of the advertising industry which invested resources into increasing knowledge of how to persuade the public to increase their consumption of resources well beyond what was needed to satisfy their basic needs. This is the antithesis of my description of *NQU*, because instead of satisfying human needs and wants with less *MQU*, it strives to increase needs and wants, while increasing the consumption and degradation of *MQU*.

Another crucial component of *NQU*

Knowledge is not the only component of *NQU*. As described in chapter 2 (section 2.2.3), the fruit tree symbolizes the *Scholar* – who represents the production of knowledge, as well as the *Tzaddik* or 'Righteous one'. The role of the Tzaddik, vis-à-vis material resources was discussed in the previous two chapters[374], and is illustrated by the following quote[375]:

> *This is the way of the pious and elevated people… they will* not waste even a mustard seed, *and they are distressed at every ruination and spoilage they see. If they are able to save [something], they will save it from destruction with all of their power.*

The effects such a person can have on his environment is expressed in the following Talmudic passage[376]:

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[372] Victor Lebow, as quoted in: Vance Packard, *The Waste Makers* (New York, 1963), p. 21.
[373] The knowledge I am referring to here is the knowledge of how to persuade people to, as Lebow prescribes: *seek our spiritual satisfaction, our ego satisfaction, in consumption…* (to engineer how to have) *things consumed, burned up, worn out, replaced, and discarded at an ever increasing rate*.
[374] For examples, see sections 2.2.3, 3.1.1, and 3.15.
[375] *Sefer HaChinuch*, commandment 529.
[376] B.T. Brachot 17b.

אמר רב: בכל יום ויום בת קול יוצאת מהר חורב ואומרת : כל העולם כולו נזונין בשביל חנינא בני , וחנינא בני - די לו בקב חרובין מערב שבת לערב שבת. (תלמוד בבלי מסכת ברכות יז:)

> *Rav said, "every day a Heavenly voice announces from Mount Horeb: "The entire world is nourished for the sake of my son Chanina, and for my son Chanina, a kav [approximately 2.2 liters] of carob from erev Shabbos to erev Shabbos [in other words, each week] is sufficient".*

In this passage, R. Chanina represents the epitome of the Tzaddik. Through his good acts (*NQU*) he benefits the entire world, to the extent that it is nourished (provided with *MQU*) for his sake. Nevertheless, he takes only the barest minimum of *MQU* to maintain his own existence[377]. According to the Talmud, this is considered such an important example, as to merit a daily reminder by a Heavenly voice to the rest of creation.

I find it difficult to name this added component of *NQU*, which is embodied by the 'Tzaddik' or 'Righteous one'. For lack of a better term, I will call it *righteousness*, though I am not completely comfortable with this term. 'Righteousness' is difficult to define, but it clearly includes the character traits of modesty, humility, self-discipline, honesty, balance, appreciation, consideration and responsibility.

Just as *MQU* has been defined as matter and energy ordered in a way that benefits man, and knowledge has been defined as information ordered in a way that benefits man, righteousness can be considered a beneficial order of behavior. Contemporary Jewish scholar, R. Aharon Lichtenstein expresses the relationship between what I am calling 'righteousness' and the quality of the environment in the following words[378]: *Jewish morality stands firmly on a base of self-control, frugality and restraint. Without this foundation, all of the ecological measures in the world will be in vain.*

The *'righteousness'* component of *NQU* is complementary to the component of *knowledge*. Knowledge is required to know what is the best use for each resource and how to best utilize it for that purpose. Righteousness is required to actually utilize each resource for the best purpose when there are competing demands that are pulling in other directions. Righteousness ensures that the knowledge is applied and used for the ultimate benefit of man, including protecting the quality of his environment. As opposed to the knowledge, however, righteousness is not easily produced or transmitted from place to place or generation to generation. Only the 'ethical codes' or guidelines of what constitutes 'righteousness' can be transmitted. The production of righteousness, through what might be termed a 'moral-ethical' education, will be discussed further in the next chapter (section 5.2.3.4).

NQU as a substitute for *MQU*

[377] It is interesting to note that this example is taught in the context of existing directly from carobs – which grow on fruit-producing trees. This may represent the barest possible human subsistence, with the slightest negative environmental impact, as opposed to subsisting on vegetables, which may require yearly planting and cooking, or bread, which requires yearly planting, grinding, cooking, etc.

[378] R. Aharon Lichtenstein, "Man and Nature – the Social Aspect," in: *Judaism in our Modern Society* (Jerusalem: Israel Ministry of Education, Branch for Religious Culture, 1971, p. 108.
מוסר היהדות עומד איתן על בסיס של ריסון, הסתפקות והתאפקות. בלא בסיס זה יהיו לשווא כל האמצעים האקולוגיים שבעולם.

NQU enables man to utilize the material resources around him in more effective and efficient ways to gain additional benefit from the same resources. Today's increased level of knowledge (in terms of knowledge of what resources are available and how to utilize the resources) is, arguably, the essential difference between the situation in the world today and the situation that existed centuries earlier, when the planet could only support a fraction of the current human population, at a far lower standard of living. This despite the fact that the material resources potentially available to man in the past were at least as great as they are today.

The role of *NPC* and *NQU* in the 'Wealth of Nations'

Man's role as *NPC*, or the producer of *NQU*, is of critical importance in the principle of *bal tashchit*. I suggest that *NPC* includes all of the instruments that man creates in order to assist in the production of both knowledge and righteousness. According to *Where is the Wealth of Nations* (W.W.O.N.), a report recently published by the World Bank[379], what I am calling *NPC* and *NQU* represent the major component of wealth in most human societies. The W.W.O.N. report found that most of (almost) every country's wealth is concentrated in what they term 'intangible capital', which they define as follows[380]: *Intangible capital is calculated as a residual, the difference between total wealth and the sum of produced and natural capital. Since it includes all assets that are neither natural nor produced, the residual necessarily includes human capital – the sum of knowledge, skill and know-how possessed by the population. It also includes the institutional infrastructure of the country [such as the government and judicial system] as well as the social capital – the level of trust among people in a society and their ability to work together toward common goals*.

The W.W.O.N. report reports that worldwide, *natural capital* (the sum of nonrenewable resources including oil, natural gas and mineral resources, cropland, pastureland, forested areas and protected areas[381]) accounts for 5 percent of total wealth. *Produced capital* (the sum of machinery, equipment and structures, including infrastructure, and indirectly including the value of urban land[382]) accounts for 18 percent of total wealth, with intangible capital making up the remaining 77 percent of total wealth in the world[383]. Intangible capital comprises over 80 percent of the total wealth in most high-income countries, and less than 60 percent of total wealth in the lowest income countries, where natural capital usually makes up between one quarter and one half or more of the total wealth[384].

It is important to note that, according to the W.W.O.N. report[385]: *The services provided by ecosystem, such as the hydrological functions of forests and the pollination services of insects and birds, are indirectly captured in the natural wealth estimates through the values of cropland and pastureland [natural capital], but no explicit value for ecosystem services is estimated, owing to data limitations.* The value of ecosystem services (what I am calling *MPC*) is very difficult to estimate, and can, by some estimates, dwarf the value of produced capital – as will be discussed

[379] The International Bank for Reconstruction and Development/The World Bank, *Where is the Wealth of Nations? Measuring Capital for the 21st Century*, (Washington, D.C., 2006). Available at: http://siteresources.worldbank.org/INTEET/214578-1110886258964/20748034/ALL.pdf.
[380] Ibid, p.23.
[381] Ibid.
[382] Ibid, p.22.
[383] Ibid, p.26.
[384] Ibid, pp.20-21.
[385] Ibid, p.24.

later in the next chapter (section 5.2.3.5). Nevertheless, the value of these ecosystem services (at least in the more developed countries[386]) can be expected to remain below the value of what the W.W.O.N. report is calling 'intangible capital', which includes what I am calling *NPC* and *NQU*.

Reformulating the definition of *bal tashchit*, in relation to 'sustainability'

According to the W.W.O.N. report[387]: *Wealth, welfare, and sustainability are closely interlinked. Pezzey (1989) suggested a straightforward definition of sustainability: a development path is sustainable if utility does not decline at any point along the path.*
Pezzey's definition of sustainability, as reported in the W.W.O.N. report, can be applied to the principle of *bal tashchit*. Substituting *QU* for *utility*, a sustainable approach to resource management is where *QU* does not decline. In other words, any degradation of *QU* is at least compensated for by a gain of *QU* – in some form – elsewhere so there is no net loss of *QU*. This can include a loss of *MQU* that is compensated for by a gain in *NQU*.

I can now reformulate the principle of *bal tashchit* from 'a prohibition of needlessly destroying resources' *to a prohibition against causing a net loss of QU*. This fits in well, in my opinion, with the ruling of Maimonides discussed in the previous chapter (section 3.1.4) that *every loss enters into this prohibition* [of *bal tashchit*].

4.3 – Re-examination of Deuteronomy 20:19-20

Using the concepts introduced in this chapter, I can reinterpret Deuteronomy 20:19-20 as follows:

When thou shalt besiege a city a long time, in making war against it to take it

Even in the most extreme situation, for example, when you are at war[388] and least likely to be concerned with conserving resources; and when you put the enemy in a siege to force surrender or degradation.

thou shalt not destroy its trees

Don't destroy or degrade the *MPC*, the natural life-support system's productive capacity for producing benefits for man.

by forcing an axe against them

By damaging the *MPC* without proper care or consideration.

for thou mayst eat of them, and thou shalt not cut them down

[386] See section 4.4 below for a discussion of developed and developing countries.
[387] Ibid, p.15 (Box 1.1).
[388] Warfare, particularly in its modern form, is arguably the greatest destroyer, degrader and consumer of *QU* of all human activities.

The productive natural environment is there to produce *MQU* and provide necessary life-support services for you. Do not destroy the *MPC* – the productive system, but rather, you may consume the *MQU* it produces in a sustainable way.

for man is a tree of the field

A) because man's life support system, his growth and development (progress) and his achieving his highest potential is dependent on the *MPC* (natural life-support system's productive capacity) as represented by fruit-producing trees.

B) Just as a tree represents *MPC*, the producers of *MQU* for the benefit of man, so too, man, represents *NPC*, as a producer of *NQU*, which can be even more beneficial to man and the world than *MQU*. Therefore, just as it is forbidden to needlessly destroy a tree, all the more so, don't needlessly destroy human life, even in the extreme case of war. This may be alluded to in the Biblical requirement to offer peace terms under which the human population will be spared before besieging an enemy[389].

to bring [the city] before thee in a siege.

The purpose of a siege is to – in effect – put the enemy in a *closed system*[390]. The enemy is surrounded and cut off from his larger environment. A siege prevents access to necessary resources such as food and water – the sources of which were normally found outside of the besieged city walls. A siege also prevents or deters the removal of wastes. Without the replenishment of necessary resources (carriers of *MQU*) and the removal of waste materials (carriers of *negative MQU*), the besieged enemy is forced to either surrender or rapidly degrade to the point of destruction. Man's life support system, his growth and development (progress) and his achieving his highest potential shouldn't be placed in a closed system cut off from it sources, to be allowed to degrade.

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[389] Deuteronomy 20:10-12. In a similar vein, R. Yaakov Zvi Mecklenburg (*Haktav v'hakabala*, repr. Jerusalem. 2005, Deut. 20:19, p.52a) writes: *For as man, so is the tree of the field when it is besieged by you …Just as the enemy who has surrendered and is willing to pay tribute must not be destroyed, so the fruit tree which gives you tribute (fruit) must not be cut down.*

[390] While the earth is also considered a 'closed system', it seems that smaller closed systems, such as a besieged city, are not able to provide the necessary ecological services that larger and more sophisticated closed systems, such as the earth are able to provide. An interesting recent example of this is the 'Biosphere 2' experiment of the early 1990's. Biosphere 2 is a man-made structure intended to duplicate the earth's closed ecosystem; meaning it was open to incoming energy from the sun but closed to any exchange of matter with the outside. The biosphere was designed to provide all of the necessary life-support processes present on the earth, which would theoretically provide its inhabitants with a viable and self-sustaining life-support system. While carefully designed and built, the biosphere failed to provide a viable life-support system for its inhabitants. As Cohen and Tilman (J. Cohen and D. Tilman, 'Biosphere 2 and Biodiversity: The Lessons So Far', in *Science* (November 15, 1996), pp. 1150-1151) write: *Despite the enormous resources invested in the original design and construction (estimated at roughly $200 million from 1984 to 1991) and despite a multimillion-dollar operating budget, it proved impossible to create a materially-closed system that could support eight human beings with adequate food, water and air for 2 years. The management of Biosphere 2 encountered numerous unexpected problems and surprises, even though almost unlimited energy and technology were available to support Biosphere 2 from the outside."* By the end of the experiment, scientists concluded, "*No one yet knows how to engineer systems that provide humans with the life-supporting systems that natural ecosystems provide for free…. Despite its mysteries and hazards, Earth remains the only known home that can sustain life.*

Only the trees which thou knowst that they be not trees for food, thou shalt destroy and cut them down; and thou shalt build bulwarks against the city that makes war with thee, until it be subdued.

Only those parts of the natural environment that you know with certainty (at today's level of knowledge) do not produce or provide needed *MQU* may be destroyed for a purpose such as this, as long as there is no net loss of *QU*.

4.4 Three stages of development of the individual and of human society – parallel to three principles taught by fruit trees

I suggest that the symbolism derived from the Jewish sources on fruit-producing trees (see section 2.1) parallels three stages in the development of an individual and of human society in the following way:

1. Establishment of a sustainable life-support system. The first step is to ensure a sustainable life support system – meaning *MPC* for the production of *MQU* on a sufficient level to meet all of the basic human needs.

2. Progressive Growth and Development. Once a sustainable life-support system is established, the next step is to begin to invest surplus *MQU* (that which is not needed to provide for the basic needs) into *NPC*. This includes investing in education and research and development, and ensuring that *MQU* is used in the most efficient ways.

3. Maturity – with focus on 'quality of life' rather than physical growth. Maximizing production and throughput of *NQU* and minimizing throughput of *MQU*. Learning to do more with less. Emphasis on helping those less fortunate, through the contribution of *NQU* (and surplus *MQU* where necessary).

Most developing countries can be considered to be in the first two stages. For example, China and India can be considered to be in stage 2, self-sufficient and able to supply basic needs to the population, and building up their *NPC* as they continue to develop. Much of the developed world can be considered to be more or less in stage 3 – at least as far as knowledge goes. North America and Western Europe already have well-developed systems for education as well as research and development, for building *NPC*. Many western countries export *NQU* to developing countries. What developed countries are often lacking, in my opinion, is the 'righteous' aspect of *NQU* needed for reducing consumption and otherwise lessening negative environmental impacts.

Environmental Kuznets Curve

A related concept - which has waxed and waned in popularity over the last two decades - is the so-called *Environmental Kuznets Curve* (EKC). The EKC is based on the work of economist Simon Kuznets[391], who found that in the process of economic development, the amount of income

[391] Kuznets introduced his curve in the article "Economic growth and income inequality," *American Economic Review*, 49 (1955), pp.1-28.

inequality (which can lead to an unsustainable society) often follows an inverted U shape over time as a society matures and the gross national product (GNP) per capita increases. In other words, in the early stages of development, income equality often increases, but when the development and GNP/capita reach a critical turning point, income inequality peaks and then declines as the GNP increases, leading to a more sustainable situation. There is evidence that environmental degradation in a developing society follows a similar pattern, and that while environmental degradation may significantly worsen in the early stages of economic development – as the destruction of natural resources and the production of wastes rapidly increases (stages 1 and 2 as described above) – as the economy grows and incomes increase, people become both more concerned about environmental problems and more willing and able to invest the necessary resources to address them[392].

The idea behind the 'Kuznetz Curve' seems to be that until basic needs of a society are covered, there will not be any surplus left over for 'luxury goods' such as better income distribution or – in our case – environmental protection. After the basic needs are met, the 'surplus' resources can be invested into these 'luxury goods'. Additionally, beyond a certain 'tipping point', the efficiency of production increases, so that more can be produced with less material resources and less pollution.

The EKC has been criticized for producing too optimistic of a picture for the developing world[393]. Some developing countries seem to be mired in the first two stages of development listed above, unable to reach the turning point where they can focus on producing *NQU*. For example, Pearce and Barbier write[394]: *Recent literature on the EKC produces very little evidence in support of the view that countries ought to be able to grow out of their major environmental problems. For most indicators of environmental degradation, the turning point level of per-capita income at which the EKC peaks is well above the current level of per-capita income for most economies in the world.*

Economist Partha Dasgupta criticizes the EKC from a different perspective – that of the irreversibility of environmental damage – writing[395]: *... even today it is commonly thought that economic growth is good for the environment because countries need to put poverty behind them in order to care; or that trade improves the environment, because it raises incomes, and the richer people are, the more willing they are to devote resources to cleaning up their living space. The view's origin can be traced to the World Bank (1992), which observed an empirical relationship between GNP per head and atmospheric concentrations of industrial pollutants. Based on the historical experience of OECD countries, the authors of the document suggested that, when GNP per head is low, concentrations of such pollutants as the sulfur oxides increase as GNP per head increases, but that, when GNP per head is high, concentrations decrease as GNP per head increases further. Among economists this relationship has been christened the 'environmental Kuznetz curve'.... The presumption is false. Nature's non-convexities are frequently a manifestation of positive feedback processes, which in turn often means the presence of ecological thresholds. But if much damage were to be inflicted on an ecosystem whose ability to function was conditional on its being above some threshold level (in size, composition, or whatever), the consequence would be irreversible.... As a metaphor for the possibilities of substituting*

[392] Indur M. Goklany, *The Improving State of the World*, (Washington, D.C., 2007), pp.106-107.
[393] See for example Arik Levinson, *The Ups and downs of the Environmental Kuznets Curve* (2000), available at: www9.georgetown.edu/faculty/am16/pdfs&zips/ups%20and%20downs.PDF, and David I. Stern, "The Rise and Fall of the Environmental Kuznets Curve," *World Development* 32, no. 8, (Amsterdam, 2004) pp. 1419-1439, available at: www.steadystate.org/KuznetzCurve-Stern.pdf.
[394] David Pearce and Edward B. Barbier, *Blueprint for a Sustainable Economy* (London, 2000), pp.133-137.
[395] Partha Dasgupta, Human Well-Being and the Natural Environment, (Oxford, 2001), p.248.

manufactured and human capital for natural capital, the relationship embodied in the environmental Kuznetz curve has to be rejected.

On the other hand, Indur Goklany defends the view that increasing economic growth and technological progress can reverse environmental degradation. He attempts to deflect some or the criticism of the EKC with his *environmental transition hypothesis* (ETH), writing[396]: *The environmental transition hypothesis is superficially similar to the environmental Kuznets curve (EKC) hypothesis, which is based on an examination of data across countries or political jurisdictions to obtain a relationship between various environmental indicators and the level of economic development (or per capita income) of a country (or jurisdiction)…. However, the EKC hypothesis tends to emphasize economic development as the explanatory variable at the expense of technological change as the source of eventual environmental cleanup, while the environmental transition hypothesis emphasizes that both these forces (i.e., economic development and technological change) are coequal. The latter hypothesis also focuses on the fact that the two forces coevolve and reinforce each other in ultimately improving environmental quality.*

In my opinion, neither Pierce and Barbier, nor Dasgupta, who criticize the EKC, sufficiently address two important issues. First of all, outside help, in the way of *NQU* (such as technology transfers) can help developing countries address environmental ills before they reach a critical or irreversible point. Careful assistance from already developed countries, particular in terms of contributions of *NQU* (knowledge) can make a big difference. An example of this may be the so-called 'green revolution[397]' where developed countries developed and contributed *NQU* as well as material aid in the form of fertilizers and equipment for producing more food in developing countries. Secondly, none of them (including Goklany, who takes the same position as the EKC) address the issue of what I am calling 'righteousness' – behavioral modification on the individual and societal levels to act in a more environmentally-responsible manner.

4.5 Summary

In this chapter, I have attempted to integrate the beginnings of a principle of *bal tashchit* from chapter 3 with more contemporary concepts in western thought. The principle of *bal tashchit* that I have been describing can be seen as a broad utilitarian approach to resource management which focuses on those parts of the environment that produce and provide benefit to man. When discussing resource management, the essential aspect of a resource that gives benefit to man is a concept I am calling *QU*, which is incorporated in the matter and energy making up the resource. While the *matter* making up resources cycles in the environment, *QU* does not, but is constantly being degraded or consumed, and must be constantly renewed from an outside source. The concept of *QU* is closely related to energy, and energy plays a primary role in the production and management of *QU*. The production of material *QU* (*MQU)* is often accomplished through the process of photosynthesis. Photosynthesizers (or *producers* as they are commonly called), serve as a conduit for importing and transforming the sun's energy into a more useful form from which the man and his environment can benefit. Aside from material *QU* (*MQU*), there is another form of *QU* which is not 'material'. This entity, which I am calling non-material *QU*, or *NQU*, is produced

[396] Goklany, p.12.

[397] The 'Green Revolution' is the name given to the *increase in food production stemming from the improved strains of wheat, rice, maize and other cereals in the 1960s developed by Dr Norman Borlaug and others under the sponsorship of the Rockefeller Foundation and other organizations. This increased the crop yield in India, Pakistan, Philippines, Mexico, Sri Lanka and other underdeveloped countries, preventing large scale famine.* See http://en.wikipedia.org/wiki/Green_Revolution.

by man. Knowledge is a common form of *NQU*, and indeed, knowledge plays an even more important role in the production and management of *QU* than does energy. What I am calling 'righteousness' is another important form of *NQU* which is necessary for guiding the production and application of knowledge in the ways most beneficial for man. Man's production of *NQU* plays a key role in the principle of *bal tashchit*.

The concept of *QU* and its derivatives can be integrated with the analysis of Deuteronomy 20:19-20 to describe three basic stages of development in an individual and in a human society. This process proceeds from a basic survival mode to an unsustainable growth stage, where resources *(MQU)* are rapidly consumed and degraded, at the expense of the environment, concluding with a stable, benefit-producing stage where increasing *NQU* production and throughput enable the sustainable use of *MQU*.

The following chapter will attempt to further develop the principle of *bal tashchit* into a form that can be more-effectively applied to current environmental problems.

Chapter 5 – Building a theoretical model based on the principle of *bal tashchit*

The purpose of this chapter is to build a theoretical model for the application of the principle of *bal tashchit* to current problems. The previous chapter introduced the concept of *QU* (quality-utility) and the related terminology, which will be used in this model and for the remainder of this thesis. This terminology is presented below in tabular form.

Symbol	**Definition**
QU (quality-utility)	An entity (material or non-material) that provides benefit to man by satisfying his needs and wants and increasing his well-being and/or ability to function in this world.
MQU (material *QU*)	*QU* that is incorporated into matter or energy, from where it can be consumed for benefit, usually leaving behind waste matter or waste heat. *MQU* is the part of an object which brings benefit to man.
NQU (non-material *QU*)	*QU* which is not material, and which provides benefit to man. *NQU* can be expressed as knowledge and righteousness.
PC (productive capacity)	The capacity to produce new *QU*, in excess of what the producer of *QU* needs for its own maintenance or growth. *PC* can be seen as the reverse of degradation or consumption of *QU*.
MPC (material productive capacity)	Capacity for producing *MQU*. *MPC* includes the production of what are called 'ecosystem services'[398] such as ecosystem stability, and is often linked to 'producers' who utilize photosynthesis for producing food and other benefits.
NPC (non-material productive capacity)	Capacity for producing *NQU*. Man produces *NQU*, and this production is often a function of his level of education and intellectual and moral-ethical development.
Negative QU	The opposite of *QU*. *Negative QU* degrades the *QU* of other objects it comes into contact with. For example, heavily polluted water carries negative *QU* which can cause the degradation of water or other objects coming into contact with the polluted water. *Negative QU* can usually be neutralized with the input of sufficient *QU* – such as knowledge and energy.

Table 5.1 – Glossary of QU-related terms used in this chapter

[398] See chapter four (section 4.1.6.C) for a description of 'ecosystem services'.

5.1. Goals and Objectives

A first step in building a model based on the principle of *bal tashchit* is to express the principle in the form of goals and objectives for properly managing resources, as follows:

5.1.1 Goal – To make the best possible use of all potential resources in order to satisfy the needs and wants of man. Since *QU* has been identified as the entity that provides benefit to man, the goal is to maximize the amount of *QU* available to man and to maximize the efficiency of man's utilization of the *QU*. In order to do this, the following objectives should be met:

5.1.2 Objectives

1. Maximize *NPC* and *MPC* – Productive capacity for *QU*

    A. Maximize producers of *NQU*. Maximize the number of people who have the necessary abilities and education to contribute to the production of *NQU* on every level. This includes providing the necessary infrastructure to provide each individual with all of their basic needs. Maximize the amount of *QU* that each individual can produce by investing 'surplus'[399] resources into education and research and development. Education includes ‘moral-ethical’ education stressing self-control, concern for others, and a focus on spiritual (defined as non-physical) rather than physical pursuits. (preference for *NQU* over *MQU*).

    B. Maximize producers of *MQU*. Maximize the quantity and quality of the natural systems that provide ecosystem services to man[400]. Identify the key components of these systems and protect them from damage and degradation. Rehabilitate productive ecological systems that have been damaged or destroyed. Wherever possible, improve the ability of the environment to produce ecosystem services needed by man.

2. Maximize the efficiency of man's production and use of *MQU*:

    A. *Production of MQU* – Improve efficiency of industry and agriculture.
    B. *Utilization of MQU* – Improve efficiency of *QU* consumption and utilization.

Hawken *et al* describe this objective as increasing *resource productivity*. They write[401]: *At its simplest, increasing resource productivity means obtaining the same amount of utility or work from a product or process while using less material and energy*. For example, more fuel-efficient automobiles can provide the same utility while using less energy.

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[399] Surplus has already been defined as that which is not needed to meet basic human needs (see chapter four (section 4.2.3).
[400] These systems will be discussed in more detail in section 5.2.3.5 below.
[401] Paul Hawken, Amory Lovins and L. Hunter Lovins, *Natural Capitalism* (New York, 1999), p.12.

3. Prioritize all the needs for *MQU* and first use available *MQU* only for the highest priorities – the basic necessities. Ensure there is enough *MQU* available, at an affordable price, to meet everyone's basic needs including the following:

    A. Food and clean water
    B. Clean air to breathe
    C. Clothing
    D. Shelter
    E. Health Care
    F. Dignity (see section 5.2.3.3 for detailed discussion).
    G. Security

4. For non-essential human needs and wants, minimize throughput of *MQU*, and substitute *NQU* for *MQU* wherever possible Invest surplus *MQU* into the production of *NQU* (for example, invest excess physical capital into research and development).

    A. *Economy* – more information based, focused on producing know-how, innovation and more efficient ways of doing things rather than producing more non-basic material goods. Emphasize 'value-added' from *NQU*, for example, by focusing on research and development for renewable energy technologies and energy efficiency.

    B. *Education* – Increase education and educate all citizens to maximize *NQU* (knowledge, righteousness) and to minimize the consumption of *MQU*. Educate to properly use the physical world according to sound ecological principles. Reverse what we are calling the "Lebow effect"[402]. For example, rather than trying to persuade people to meet their spiritual and emotional needs through consumption of *MQU* (as prescribed by Lebow), educate towards meeting these needs through *NQU*. For example, promote education, which will be discussed in more detail below in section 5.2.3.4, and which should include the following:

        - Increasing awareness and appreciation of the natural environment as our life-support system, and of the benefits the natural environment provides for us.
        - Stress on non-material pursuits rather than material pursuits
        - Increasing social harmony and consideration for others
        - Increasing awareness and consideration of results of actions – including the likely effects on following generations.

    C. *Recreation, leisure and entertainment* - Encourage *NQU*-using types of recreation such as literature and nature hikes rather than *MQU*-intensive types of recreation such as automobile racing.

For example, Boersema writes[403]: *The challenge facing society today is to achieve and maintain a suitable quality of life, while reducing to a sustainable level the environmental burden to which our activities give rise…a change is also required at the deeper level of*

[402] See chapter four (section 4.2.3) for a description of the 'Lebow Effect'.
[403] Jan J.Boersema, *The Torah and the stoics on humankind and nature: a contribution to the debate on sustainability and quality* (Leiden, 2001), p. 245.

our Weltanschauung. Reduced to its essence, the 'quality of life' we are after should be sought more in activities requiring less energy, nature and raw materials: not so much in pursuance of an ideal of poverty, but ultimately because we sincerely experience that this leads to greater quality. That quality must be derived less from matters (goods and services) embodying high environmental pressure and more from activities having little impact on the environment and nature. Such activities do not have to be purely 'spiritual'; there are numerous more homely alternatives. Nature should be valued more as a defining factor of our well-being. More music and less Formula 1, and inspiring work of art in the garden instead of a new kitchen suite.

5.2 Expression of the principle of *bal tashchit* as a formalized hierarchy for the utilization of physical resources or *MQU*

The discipline of resource management involves many conflicts and tradeoffs between political, socio-economic, ethical and ecological considerations. Every individual and every society has needs and wants that often are in conflict. Sound decision-making requires reaching a proper balance between all of these in order to maximize the benefits to man, and to minimize the costs. While all of these needs are important, they are not necessarily equally important. Since *bal tashchit* prohibits only the *needless* destruction or degradation of anything man can benefit from, this necessarily implies some form of a hierarchy or prioritization of human needs according to which any destruction or degradation can be gauged[404].

5.2.1 Hierarchy for the usage of *MQU*

The principle of *bal tashchit* can be formalized as a hierarchy for the utilization of *MQU* to best need human needs and wants. The 'detailed legal framework of *bal tashchit'* presented in chapter three (section 3.2.1) already gave indication of an implicit hierarchy, which was further developed in the summary of chapter three (section 3.5), and the beginning of the fourth chapter. What this section adds to the previous work is the formalization and development of the hierarchy according to traditional Jewish textual sources. Human life and health – necessary for the production of *NQU* – were already identified in previous chapters as being the most important 'resource' protected by the principle of *bal tashchit*. The top four positions of the formalized hierarchy presented below focus on the preservation and enhancement of human life, health and wellbeing, including that which is needed, according to Jewish tradition, to enable man to maximize the production of what I am calling *NQU*. The final two positions in this hierarchy were earlier represented as *producers of streams of benefits for man* (symbolized by the fruit producing trees of Deuteronomy 20:19-20), and *objects that provide benefit when consumed* (represented by the fruits).

I don't claim that this hierarchy is absolute, or that it applies in every situation. Nevertheless, I assert that this hierarchy is now sufficiently developed to serve as a useful guide for allocating resources

[404] In my opinion, every individual and every group uses some type of a hierarchy or prioritization for deciding how to utilize their resources. Often this prioritization is informal or hidden, and it is usually very subjective. It can be different for each individual, and can change for each individual with changing circumstances. I present here a hierarchy for using resources according to traditional Jewish values that has, to my knowledge, never before been formally described, but that is evident in the Jewish sources. *QU* and similar concepts are used in an explanatory role, rather than in a quantitative or decision-making role (except in the 6th category of the hierarchy).

according to the principle of *bal tashchit*. The hierarchy is listed below (expressed in six descending categories of priority); integrated with the concepts of *QU* in section 5.2.2 and finally, described in detail, along with the relevant Torah sources in section 5.2.3.

According to this hierarchy, available resources should be used in the following order of priority:

1. To preserve and enhance human life.
2. To preserve and enhance human health and wellbeing
3. To preserve and enhance human dignity
4. To observe religious duties
5. To preserve and enhance *MPC* (fruit producing trees and other *producers* of benefits for man)
6. To allocate all surplus *MQU* in the most economically efficient way, in order to maximize the welfare of man.

Resources should be first used for the highest priority – as expressed at the top of the hierarchy. Once the needs of a higher priority have been satisfied, the resources should be used for the next category in the hierarchy. In this way, resources are used for the most important needs, as required by the principle of *bal tashchit*.

Under what seems to be a reasonable assumption – that there are diminishing returns for all *MQU*, once basic needs are met – I judge that the best way to allocate resources according to this hierarchy (for the first five categories) is to do so according to the simple economic principle of marginal returns. In other words, a resource should be allocated to each category in the hierarchy up to the point that the marginal benefits from each additional unit of *MQU* is at least equal to the marginal cost of that unit[405]. There could be, perhaps, some substitutions of *NQU* for *MQU* (in the form of new technologies, 'smarter' ways of using, and more 'righteousness'), to reduce the amount of *MQU* needed for each category, but my underlying assumption is that up to the point where basic needs are met, the demand for *MQU* is inelastic and there are no substitutes.

In category 5 of the hierarchy, *To preserve and enhance MPC*, there is probably more room for substitution for a scarcer resource with more plentiful alternatives. For example, as will be discussed in the next chapter (section 6.2.3.5), in most cases, recycled, partially treated waste water could be supplied to the natural environment in place of potable water that may be required for human needs.

In category 6 of the hierarchy, in dealing with *surplus MQU* once the basic needs of categories 1 - 5 have been met, the opportunity for substituting *NQU* for *MQU* is the greatest. While a certain amount of *MQU* is irreplaceable for meeting the needs of the first five categories, the demand for *MQU* in the sixth category, for most uses, can be expected to be very elastic. In other words, in the sixth category, a shortage of *MQU* for non-vital goods or services can be expected to result in

[405] There is, in my opinion, a great need for more research into determining, for each major resource, the points where the marginal benefits declines below the marginal cost for that resource.

additional conservation and/or substitution as *NQU* substitutes for *MQU*. Category 6 is where the investment of surplus *MQU* into *NQU* described above in section 5.1.2.4 takes particular effect, leading to more of a knowledge economy which consumes less *MQU*.

5.2.2. Integration of hierarchy with concept of *QU*

For added clarity, the hierarchy can now be integrated with the concept of *QU* and the goals and objectives discussed at the beginning of this chapter (section 5.1). The first three categories of the hierarchy (preserving human life, health and dignity) aim to provide the necessary support system to enhance and maximize *NPC*:

1. Preservation and enhancement of human life
2. Preservation and enhancement of human health
3. Preservation and enhancement of human dignity

First investing available resources into these three categories fulfills step three of 5.1.2 above – *first using MQU to fulfill basic human needs.*

The next category aims to *maximize man's production of NQU (in the form of knowledge and righteousness)*:

4. To observe 'religious duties', which will primarily entail the production of *NQU* through increasing education and moral-ethical training

Education and moral-ethical training are included in religious duties (as will be described below in section 5.2.3.4) and they help direct human energies into better producing *NQU* expressed as knowledge and righteous behavior.

The next category aims to *preserve and enhance MPC, in order to maximize the production of MQU*:

5. Promote the preservation and growth of *MPC*, the productive natural environment[406], particularly the highest producers of ecosystem services for man

Finally, the last category aims to *properly utilize 'surplus' MQU (that which remains after supplying the above needs) to maximize the welfare of man*:

6. Allocate all surplus *MQU* in the most economically efficient way, in order to maximize the welfare of man

[406] Note: as man's knowledge increases, eventually, the entire natural environment will probably be recognized as the productive natural environment (see section 3.2.2.4), and warrant protection. In the meantime, since some destruction of the environment is inevitable, any permitted destruction should be focused on those areas of the environment which are least recognized to be producing necessary ecosystem services for man.

Using material resources according to this hierarchy would be congruent with the principle of *bal tashchit* – preventing needless degradation or destruction. It is important to emphasize that all 6 categories are interconnected. Anything affecting one category will likely affect others, sometimes to the extent that the impact will 'climb' up the hierarchy of importance and become a more acute need demanding more immediate attention. For example, if the natural environment (category 5) is degraded to the point that it has a negative impact on higher categories (such as human health – category 2), then addressing this degradation takes on greater importance, on the level of category 2 in the hierarchy, until the problems are addressed and human health is no longer being negatively impacted. In the same way, if economic health (category 6) is degraded to the point that human dignity (category 3) is negatively impacted (such as a case where there is massive unemployment and people aren't able to find meaningful work), then improving the economy takes on greater importance until higher categories are no longer being compromised. On the other hand, while a more robust economy can have a positive impact on life, health, and dignity, the measures taken to improve the economy should be consistent with the hierarchy. The natural environment should not be sacrificed unless absolutely necessary.

The following section presents the hierarchy in greater detail with explanation and sources for each category.

5.2.3 Detailed description of hierarchy with relevant sources

1. To preserve human life

Jewish tradition places human beings at the pinnacle of the created world, and the commandment to preserve human life[407], takes precedence over all other commandments of the Torah, excepting for the prohibitions against murder, sexual immorality and idol worship (see chapter three (section 3.2.2.5). For example, medical ethicist A. Steinberg writes[408]: *Judaism teaches us that the value of human life is supreme and takes precedence over virtually all other considerations*.

According to Jewish tradition, a primary function of material resources – which occupy a lower position in the creation than human life – is to provide a life-support system for human beings. Therefore, the highest priority for the investment of material resources is the preservation of human life. This includes providing the resources necessary for life (such as clean air, water, food, and shelter) as well as creating conditions necessary for the maximum preservation of human life.

2. To preserve and enhance human health

After preserving human life, the next highest priority for using resources is for preserving and enhancing human health[409]. Webster's dictionary defines health as[410]: *soundness of the body or mind; freedom from disease or ailment*. The World Health Organization (WHO) defines health in

[407] B.T. Shabbot 132a and Yoma 85b. See also Shulchan Arukh, Orach Chayim, vol. 2, 328:2, p. 497.
[408] A. Steinberg, "A Comparative Moral Approach to Suicide – A Jewish Perspective," *Israel Journal of Medical Science*, vol. 23 (1987), pp. 850-852.
[409] B.T. Shabbat 129a, 140b - "*bal tashchit d'gufa adif*" (preventing damage or destruction of the body has a higher priority than preventing the damage or destruction of other resources. See 3.2.2 above)
[410] Random House Webster's Unabridged Dictionary, 2nd ed. (New York, 1998), p. 882.

a broader way as[411]: *a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*. Health enables the populace to live more productive lives, producing more *NQU*. Preserving and enhancing human health – as a progression from the previous category of preserving human life – requires additional resources to ensure a sufficient supply of healthy food, pure water[412], adequate health care, etc. to meet all of the needs of the human population and to prevent avoidable harm to human health.

Preventing harm or damage to man or his environment is an integral part of the principle of *bal tashchit*. This is also consistent with the overall goal of conserving resources (including monetary resources). It is widely recognized that it takes more resources to rehabilitate an unhealthy human or a polluted environment than it does to prevent the problems in the first place. For example, in a 2003 report on the cost-effectiveness of pollution control, the U.S. Environmental Protection Agency studied the performance of over 60 pollution prevention programs over the decade between 1990 and 2000[413]. The study found that *in almost every case, these efforts have not only led to environmental improvement, but have been cost-effective, saving millions of dollars per year*. The report showed a high benefit to cost ratio for pollution prevention assistance programs, and reported that over a two year period between 1998 and 2000, there were six dollars of pollution prevention savings for every dollar invested by the Federal Government. Similarly, according to the 2005 Millenium Ecosystem report[414]: *the cost of [ecosystem] restoration is generally extremely high compared with the cost of preventing the degradation of the ecosystem. Not all services can be restored, and heavily degraded services may require considerable time for restoration*.

3. To preserve and enhance human dignity

The next level in the hierarchy is the preservation and enhancement of human dignity. This is supported by the following Talmudic passage which prioritizes three of the categories in the hierarchy – preservation of human health (category 2), preservation of human dignity (category 3) and the maintenance of ones immediate environment[415] (category 5): [416]

> אמר רב יהודה אמר רב: לעולם ימכור אדם קורות ביתו ויקח מנעלים לרגליו, הקיז דם ואין לו מה יאכל - ימכור מנעלים שברגליו ויספיק מהן צרכי סעודה. (תלמוד בבלי מסכת שבת קכט:א)

> *R. Yehuda said in the name of Rav, A person [who is lacking in money] should sell the beams of his house in order to buy* shoes *for his feet. A person who let blood and has*

[411] World Health Organization, available at: http://www.who.int/suggestions/faq/en/.
[412] An important part of maintaining human life and health is a healthy environment, in terms of an environment that optimizes the provision of unpolluted air, water, food, and other necessary services. As I discussed above (section 5.2.2), if environmental conditions are negatively impacting on human health, then protecting and improving the environment (normally category five) becomes a higher priority, moving up to category two).
[413] United States Environment Protection Agency, *An Ounce of Pollution Prevention is Worth Over 167 Billion Pounds of Cure: A Decade of Pollution Prevention Results 1990 – 2000*, by the National Pollution Prevention Roundtable, (Washington, 2003); available at: http://www.p2.org/p2results/2418_historyfinal.pdf.
[414] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington D.C., 2005), p. 23.
[415] A 'house' can be understood to represent a person's immediate environment. This is evident in other cultures as well. For example, the very word *eco logy* – the study of the relationship between an organism and its environment – is derived from the Greek word *oikus* or house.
[416] B.T. Shabbot 129a.

> *nothing to eat [putting his health and perhaps his life in danger], should sell the shoes from his feet and supply from them [from the money] the needs for a meal.*

According to the commentary of Rashi on this Talmudic passage, a person should go so far as to sell the beams of his house in order to buy shoes because *there is no greater disgrace (lack of dignity) than one who walks in the marketplace without shoes*[417]. This indicates the importance of human dignity; here represented in the Jewish tradition by the wearing of *shoes*[418].

The Hebrew word for *dignity*, כבוד, can also be translated as *honor* and *importance*. Webster's dictionary[419] defines dignity as: "bearing, conduct, or speech indicative of self-respect … nobility or elevation of character." It is important to stress the distinction between dignity and other traits such as arrogance or hubris – which may appear to be similar to dignity but which have an opposite effect on man's relationship with others and with his environment. Dignity is here defined as self-respect combined with respect for others, and humility.

Jewish tradition places great importance on promoting and maintaining a high level of human dignity. In the words of historian Paul Johnson[420]: *To them [the Jews] we owe the idea of equality before the law, both divine and human, of the sanctity of life and the* dignity *of the human person (emphasis added).* Likewise, German scholar Aloys Hütterman writes[421]: *If one investigate the major differences between the Babylonian and Hellenistic cultures on the one side and the Israelite on the other, one will find three major factors: One is the belief in the one and only God, the second is the* high esteem for human beings, *and the third is the biological wisdom and the sincere* concern about nature and ecology. *All the major differences which makes the Israelites such an exclusive people, unique in the whole of antiquity, may be definitely traced back to these three major factors (emphasis added).*

The Jewish emphasis on human dignity is based on the principle that humans were uniquely created '*in the image of the Creator*[422]', and are therefore intrinsically worthy of great respect. The principle of man being created in the image of the Creator is difficult to understand. Some interpret this to mean that man also has the ability to create. For example, R. Joseph B. Soloveitchik (1903–1993) writes[423]: *Man's likeness to The Creator expresses itself in man's striving and ability to be a creator*. It may be suggested that man's *NPC*, his ability to produce or 'create' new knowledge (such as new and better ways to utilize the physical resources around him) is part of this creative ability unique to man. Being created in The Creator's image gives man a unique and very important status in the creation, in the Jewish tradition.

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[417] Commentary of Rashi on B.T. Shabbot 129a - שאין לך ביזוי מן המהלך יחף בשוק - ויקח מנעלים

[418] Another example in the Jewish sources of the link between shoes and dignity is the case of the Levirite marriage (Deuteronomy 25:5-10), where one who refuses to perform the Levirate marriage is publicly disgraced by his brother's childless widow in the following two ways: She *takes off his shoe*, and spits in front of his face. One can speculate that (according to Jewish tradition) just as man's dignity requires his separation and elevation above the animal world (as discussed further in this section) so too it requires the separation and elevation above the earth provided by his wearing shoes on his feet.

[419] Random House Webster's Unabridged Dictionary, 2nd ed. (New York, 1998), p. 553.

[420] Paul Johnson, *History of the Jews*, (New York, 1988), p. 585.

[421] Aloys Hütterman, *The Ecological Message of the Torah* (Atlanta, 1999), p. 198.

[422] Genesis 1:27, 9:6.

[423] Joseph B. Soloveitchik, *The Lonely Man of Faith* (New York, 1992), p. 12.

Dignity as a function of separation of man from nature

One of the ways of promoting and preserving human dignity, in Jewish tradition, is by maintaining a clear separation and elevation of humans above non-human forms of life; which were not created in the image of the Creator, and are therefore not worthy of the same level of dignity. In other words, man maintains his dignity by making a clear separation between himself and the natural world and by placing man in a dominant position relative to the latter. This domination is clearly expressed in the following Torah verse[424]:

> ויברך אתם אלקים ויאמר להם אלקים פרו ורבו ומלאו את הארץ וכבשה ורדו בדגת הים ובעוף השמים ובכל חיה הרמשת על הארץ (בראשית א:כ"ח)
>
> *And the Creator blessed them [Adam and Eve] and said to them Be fruitful and multiply and replenish the earth and subdue it and have dominion over the fish of the seas and over the birds of the air and over every living thing that moves on the earth.*

R. Soloveitchik expresses the relationship between the dignity of man and his domination of nature as follows[425]: *Dignity of man, expressing itself in the awareness of being responsible and of being capable of discharging his responsibility cannot be realized as long as he has not gained mastery over his environment…Civilized man has gained limited control of nature, and has become, in certain respects, her master, and with his mastery he has attained dignity as well.*

Interestingly, this very separation from and dominance over nature – so crucial to man's dignity – has been attacked by prominent voices in the environmental movement as a primary cause for man's destructive behavior towards the natural environment. For example, in one of the seminal early articles on the origins of environmental problems, Lynn White writes[426]:

> *Our daily habits of action, for example, are dominated by an implicit faith in perpetual progress which was unknown either to Greco- Roman antiquity or to the Orient. It is rooted in, and is indefensible apart from, Judeo- Christian theology… What did Christianity tell people about their relations with the environment? Christianity inherited from Judaism not only a concept of time as nonrepetitive and linear but also a striking story of creation. By gradual stages a loving and allpowerful Creator had created light and darkness, the heavenly bodies, the earth and all its plants, animals, birds, and fishes. Finally, the Creator had created Adam and, as an afterthought, Eve to keep man from being lonely. Man named all the animals, thus establishing his dominance over them. The Creator planned all of this explicitly for man's benefit and rule: no item in the physical creation had any purpose save to serve man's purposes. And, although man's body is made of clay, he is not simply part of nature: he is made in The Creator's image… Man shares, in great measure, The Creator's transcendence of nature. Christianity, in absolute contrast to ancient paganism and Asia's religions (except, perhaps, Zorastrianism), not only established a dualism of man and nature but also insisted that it is The Creator's will that man exploit nature for his proper ends…Hence we shall continue to have a worsening ecologic crisis until we reject the Christian axiom that nature has no reason for existence save to serve man.*

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[424] Genesis 1:28.
[425] Soloveitchik (1992), p.16-17.
[426] Lynn White, Jr., 'Historical Roots of Our Ecological Crisis', *Science*, vol. 155, (1967), pp 1203-1207.

White's claims against the 'Judeo-Christian' sources of environmental destruction have been widely cited and commonly disputed[427]. Some of White's claims seem to be based on a misunderstanding of the Biblical verse from Genesis 1:28 quoted above, particularly the concepts of 'subdue' and 'dominion[428]'. This misunderstanding – concerning the Biblically mandated role of man vis à vis the natural environment – has a long history. For example, R. Abraham Ibn Ezra writes[429]:

> וחסרי דעה חשבו כי ממשלת האדם בארץ כממשלת השם בשמים ולא דברו נכונה כי מלכות השם בכל משלה רק פירוש נתן לבני האדם שהאדם כמו פקיד אלקים בארץ על כל מה שיש בה והכל בדבר השם (אבן עזרא תהלים קטו:טז)

> *The ignorant have compared man's rule over the earth [such as described in Genesis 1:28] with The Creator's rule over the heavens. This is not correct, for The Creator rules over everything. The meaning of 'He gave it to people' is that man is The Creator's* steward *over the earth, and must do everything according to The Creator's word* (emphasis added).

White also disregards other, counterbalancing verses in the Biblical account of the creation such as:

ויקח ה' אלוקים את האדם ויניחהו בגן עדן לעבדה ולשמרה (בראשית ב:ט"ו)

> *And The Creator took the man and put him in the Garden of Eden to work it and to* protect *it*[430] *(emphasis added)*

The expression לשמרה (to protect it) means to be a שומר (guard) over something that doesn't belong to you – in this case, the unspoiled world of the Garden of Eden – so that it comes to no harm.

Finally, while blaming the environmental crisis on 'Judeo-Christian' theology, and its shared Hebrew Bible, White ignores the Biblical principle of *bal tashchit*, which prohibits some of the very destructive activity that he claims the Bible authorized[431].

Philosopher Peter Singer, a prominent voice in the animal rights movement, rejects the Biblically-ordained separation and elevation of man above other life forms. Singer writes that there is no relevant characteristic that distinguishes all humans from all members of other species, by which

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[427] For example, in his article (loc. cit.)David Nir cites the website: http://ecoethics.net/bib/1997/enca-001.htm, which contains "a comprehensive list of academic writings responding to Lynn White's 1967 thesis".

[428] These words are translations of the Biblical Hebrew words כבשה ('subdue') and רדו ('have dominion over') both of which can be interpreted in more environmentally-friendly ways. For example, R. Hirsch, in his commentary on Genesis 1:28 suggests that כבשה refers to the inanimate parts of the creation, and Ibn Ezra suggests that man's role relative to the world around him (environment) is that of a 'steward of God' (פקיד אלקים) rather than as a ruler who can act according to his whims.

[429] R. Avraham Ibn Ezra, on Psalm 115:16.

[430] Genesis 2:15.

[431] It is interesting to note that whereas Christianity took from Jewish tradition the Hebrew Bible and its account of the creation – including the 'offending' verses cited by Lynn White – it ignored most of the Biblical commandments, such as *bal tashchit*. As Boersema writes (Leiden, 2001, p.247), "The fact that such rules [such as the Biblical dietary laws, which *acknowledge imperfection, both human and worldly, while providing a rudder with which to steer by, by their reference to the ideal*] have vanished from the Christian tradition without anything taking their place is to be regretted." Additionally, the Christian interpreters of Deuteronomy 20:19-20, lacking the Jewish oral tradition, limited *bal tashchit* to only a literal understanding of the verses - cutting down fruit-producing trees in the time of war.

humans are deserving of a higher level of intrinsic dignity. He brings examples of humans who are mentally retarded, and therefore, not intellectually superior to some animals and asks by which basis such a human can be considered superior or worthy of greater dignity than an animal[432]?

The point of contention seems to be whether man can maintain his dignity without a separation from and elevation over non-human forms of existence. Jewish tradition, as described above, apparently holds that this separation and elevation are necessary. This idea is not unique to Judaism. For example, philosopher Robert Andorno writes[433]: *To uphold that human beings deserve unconditional respect does not inevitably lead to an irrational exploitation of nature. Respect of human beings and respect of nonhuman animals and plants, even at different levels, are not opposing ideas. But the nature of this respect is different in both cases, and that difference (absolute respect in the first case, relative respect in the second) is precisely what makes human dignity. That is why the idea that Homo Sapiens is just a species among others seems to strike at the very heart of the notion of human dignity. If all animals – including humans – are equal, no one has a dignity, because the notion of dignity implies precisely an intrinsic distinction between the human realm and the extra-human realm.*

The role of dignity in relation to the management of natural resources

To introduce another point relevant to the relationship between the dignity of man and his behavior towards the environment, it may be suggested that humans lacking in dignity and self-respect will behave with less respect towards others and towards their environment than humans with higher levels of dignity and self-respect. For example, in an article on Judaism and the quality of the environment, R. Aryeh Carmell writes[*434*]: *Since the debased human being is the greatest pollutant, the long-term effect [of constant exposure to decadent culture] on the whole of our environment must be harmful to the extreme.* R. Carmell does not clearly define for us what is meant by the 'debased human being' nor does he clearly explain why the debased human is called 'the greatest pollutant'. I suggest that R. Carmell is describing someone lacking what I have defined above as *dignity*, in combination with a lack of 'righteousness' already defined, and which will be further discussed in the next category. Such a 'debased' human may be more likely to produce *negative QU*, as described in chapter four (section 4.3.6).

The link between human dignity and the quality of the environment also finds some support amongst environmental professionals. For example, the Environmental Protection Agency of New South Wales, Australia reports that one of the reasons that people litter [throw garbage into their environment] is a lack of caring driven by a negative self image[435].

R. Simcha Zissel Ziv (1824-1898), considered to be one of the pre-eminent ethicists in recent Jewish history explains the relationship between the dignity of man and his relationship with the environment as follows[436]:

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[432] Peter Singer, "All Animals are Equal", *Environmental Ethics*, eds. David Schmidtz and Elizabeth Willot (Oxford, 2002), pp 17-27.
[433] Roberto Andorno, *The paradoxical notion of human dignity*; available at: http://www.revistapersona.com.ar/9Andorno.htm.
[434] R. Aryeh Carmell, "Judaism and the quality of the environment," *Challenge – Torah views on science and its problems*, 2nd ed. (Jerusalem, 1976), pp 500–525.
[435] EPA of NSW, Australia, available at: http://www.epa.nsw.gov.au/litter/factsaboutlitter.htm#where.
[436] R. Simcha Zissel Ziv, *Hochma u'Mussar* (Jerusalem, 2000), vol. 3, p. 313.

כי באמת צריכים לכבד כל דבר עד שהוזהרנו לבל נשחית שום דבר. (וזה מטעם ענין כבוד...). ולטובת האדם הלא הותר לנו לשחוט את הטעון שחיטה , ולהרוג את המותר בהריגה . ולמה זה? הלא דעת לנבון נקל שהוא מפני יקרת המעלה הנמצאת בו, היא מעלת המדבר, היינו כוח ההשכלה אמיתית הנמצא בו, המתדמה בזה עם בורא עולם.

> *In truth we are required to respect every object, to the extent that we are warned not to [needlessly] destroy anything. (and this is because of respect [that is due to all of the creation]). And yet, for our benefit, aren't we permitted to slaughter that which we need to slaughter [before eating] and to kill that which it is permitted to kill [for example, animals and insects that are dangerous or a nuisance to man], and why is this? Isn't it obvious to anyone with understanding that it is because of the great value of the one who speaks [man], meaning his true intellectual abilities, which make him similar to the Creator of the world.*

According to R. Ziv, only man's great importance, by virtue of his being created in the image of the Creator, permits him to destroy another part of the Creator's creation. This destruction is only permitted if the need is sufficient, according to the principle of *bal tashchit*.

R. Ziv makes another important point later in the same text, which relates to the concepts of *MQU* and *NQU* discussed above[437]:

והנה מי שנמצא אצלו הרבה כסף וזהב הוא מכובד בעיני הבריות, מפני כי בכספו וזהבו יוכל להנות לרבים. אבל גבול יש כמה יכול להנות. לא כן בחכמה כי יכול להנות בלי גבול. וגם אם כל העולם כולו יהנה מחכמתו לא יחסרו ממנו מאומה.

> *And behold, one who has a lot of silver and gold is honored in the eyes of the masses, because with his silver and gold he can benefit the public. But, there is a limit to how much benefit can be derived [from his riches]. This is not the case with wisdom [which is worthy of even greater honor], because it can give benefit without limit. And also, if the entire world benefits from his wisdom, it hasn't taken anything away from him [or his wisdom].*

Here, R. Ziv adds a very important point. In Jewish thought, honor or *dignity* comes from the ability to *benefit* others. The more potential someone has to benefit others, the more dignified they are considered to be. Therefore, dignity is given to a wealthy person, and even more to the Torah scholar or Tzaddik – because of the great benefit they (potentially at least) can provide for others. To use the nomenclature introduced in the previous chapter, we can interpret the 'silver and gold' of the wealthy person as *MQU*, which can temporarily benefit others, and the wisdom of the wise person as *NQU*, which can give sustained benefit to others.

Closer examination of the dignity of man in the Jewish sources

Not only do the Jewish sources place upon man a high level of intrinsic dignity – by virtue of his being created in the 'Image of the Creator', but they also forbid the willful degradation of this dignity. From a Jewish perspective, a person is not the sole owner of his own dignity. In the words of R. Abraham Isaac Kook[438]:

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[437] Ibid, p. 314.

[438] R. Abraham Isaak Kook, *Mussar Avicha* (Jerusalem, 1985), ch. 3, p. 44:
אמנם שמירת הראוי לפי ערכו באמת, כשהוא בלא הטעאה, נראה שאין בזה משום גאוה נמי איכא, ואדרבא מצוה נמי איכא, והרי דעת פוסקים שאסור לוותר על כבוד הבריות אפילו במקום מצוה.

> *Protecting [the dignity] one rightfully deserves is not a matter of arrogance at all. On the contrary, there is a mitzvah to do so. The opinion of the halachic authorities is that it is prohibited to relinquish human dignity, even in the case of a [competing] mitzvah.*

Since according to the Jewish tradition, the dignity of man is based on being created in the 'image of the Creator', the more one fulfills their potential for emulating the Creator, the more he actualizes this dignity. The Tzaddik and Torah Scholar (symbolized by fruit-producing trees) are the ultimate representatives of actualizing this potential, in the Jewish tradition. Note also that R. Kook writes that *it is prohibited to relinquish human dignity, even in the case of a [competing] mitzvah* ('religious duty'). Performance of religious duties is the next category in our hierarchy, as will be discussed below.

Using the concepts and terminology introduced in Chapter 4, it is possible to speculate that the separation of man from nature influences man's role as a producer of *NQU*. If, as Jewish tradition indicates, this separation adds to the dignity of man, and the emphasis on his intellectually creative abilities, this would likely enhance his role in the production of *NQU*. Man is unique as a producer of *NQU* which allows him to create and innovate in order to improve the world around him, and this is, as R. Soloveitchik indicated above, a great part of the dignity of man.

4. Performance of religious duties

The performance of what I am calling *religious duties,* referred to in Jewish tradition as *mitzvot* (מצות) takes precedence over the value and preservation of material resources that are not required for the first three categories (preservation of human life, health and dignity)[439]. While the previous two categories in the hierarchy were focused on promoting man's physical well-being and development, the third and fourth categories stress man's intellectual and moral-ethical development. As discussed in Appendix A., one of the underlying principles of *bal tashchit* is the corrupting (degrading) effect that wasteful behavior has on man, aside from the negative environmental effects of this wasteful behavior.

According to Jewish tradition, the Creator's will is revealed both in the creation (as expressed in what we call natural law[440]), and in the Torah[441], which is considered a higher level of the

[439] An example of this is the Torah command to cover the blood of certain slaughtered animals (birds and kosher game animals such as deer) with earth (Leviticus 17:13). The Talmud (B.T. Chullin 88b) discusses the hypothetical case of one who has a need to slaughter an animal for its meat, but has no earth or other suitable material available to fulfill the mitzvah of covering the blood. The Talmud rules that he is permitted to go to the extreme of scraping off gold from a gold coin or burning a useable garment in order to produce a powdery material for fulfilling this command, even though the value of the objects destroyed to perform this mitzvah far exceeds the value of the meat, under normal circumstances. From this we see that consuming resources for the performance of a command can take precedence over the economic value of the resources being consumed.

[440] Natural laws are phenomena expressed in nature, including the law of gravity or the laws of thermodynamics, which apply consistently and universally. According to Jewish tradition, natural laws are part of the creation and can be suspended or overruled at the will of the Creator. Exceptions to the natural laws are commonly referred to as *miracles*. Examples of miracles abound in the *Tanach*, and include the parting of the Red Sea during the exodus from Egypt.

[441] While most of the commandments in the Torah are incumbent only upon Jews, there are a seven commandments that apply universally to all of mankind (the seven commandments for the offspring of Noach – see B.T. Sanhedrin 56a). These include the positive commandment to establish a judicial system as well as the prohibitions against murder, idolatry, sexual immorality, theft, cursing God, and consuming part of a living animal (which may be interpreted as a prohibition against cruelty to animals).

Creator's will[442]. While the Torah prohibition of *bal tashchit* prohibits *needless* degradation of any part of the creation, degradation required for the fulfillment of other religious duties (as long as the destruction is not excessive) is considered consistent with the will of the Creator, and not prohibited by *bal tashchit*.

One example is the destruction of *chametz* (leavened bread or its derivatives) during the Jewish holiday of Passover. The Torah forbids Jews from possessing any *chametz* during the entire week of Passover, and Jews must destroy any *chametz* still in their possession when the holiday begins. This destruction of *chametz* – even though *chametz* is a useful resource during the remainder of the year – is not a violation of the prohibition of *bal tashchit*[443].

Interestingly, Jewish tradition sometimes refers to the religious duties or *mitzvot* that a person performs as the 'fruits' that he produces[444], which bring benefit to him and benefit to the world. These 'fruits' are non-material. Using material resources for the performance of *mitzvot*[445] can be viewed as investing *MQU* into *NQU*, which is one of the goals of the principle of *bal tashchit* listed above in section 5.12. These human-produced 'fruits' can also include inventions and other intellectual contributions which bring benefit to the world. In this vein, perhaps, R. Yisrael Lifshitz (1782-1861) calls the originators of useful inventions that benefit mankind " חסידי אומות העולם" – *righteous ones of the nations of the world.*[446]

Education as a religious duty

In Jewish tradition, education is one of the most important religious duties; in fact, the obligation of Torah education may be considered as important as all of the other obligations combined[447]. To appreciate the importance of education – as a religious duty – in Jewish tradition, it is important to realize that until the 20th century, formal education was considered a luxury in most of the world. There were not always enough available resources (*MQU*) to meet the basic needs of the populace, let alone to support a large part of the potentially productive population (teachers and students, and even young children commonly worked in the fields, factories and mines) in educational endeavors that would remove them from the work force. Nevertheless, since education is

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[442] See for example: R. I. Grunfeld, *Introduction to the First English Edition of Rabbi Samson Raphael Hirsh's Commentary on the Torah*, in Hirsch, *Pentateuch*, vol. 1, p. XIII: *"In reality, two revelations lie before us: Nature and Torah (Psalm IXX)".* See also R. Bachya, *Duties of the Heart*, vol. 1 (Jerusalem, 1970), p. 147: *"It has been stated that the relation of nature to the Torah is that of a servant to his master"*.

[443] It should be noted that the prohibition of *chametz* on Passover does not necessarily result in the destruction of useful resources. Where possible, Jews may sell or give away their chametz to non-Jews – to whom the prohibition of chametz does not apply. This is consistent with section 3.2.1.5E above which requires that if there is a feasible alternative to destroying an object, even where this destruction is permitted, then one must choose this alternative.

[444] The Talmud (B.T. Sota 46a) brings the following example: Rabbi Yochanan says: Why did the Torah [Deuteronomy 21:4 – in the case of a murder victim found dead in a field under unknown circumstances] say to bring a calf to a stream bed? The Creator said, bring an object that didn't produce fruits [a calf] … in a place that doesn't produce fruits [a barren stream bed], and atone for one who was not allowed to produce fruits [the murder victim, whose life was cut short]. What are the 'fruits' [that man produces]? Mitzvot (religious duties).

[445] In the Jewish tradition, there are 248 positive mitzvot (religious duties to perform), and 365 negative mitzvot (prohibitions). In our model, the positive mitzvot can be viewed as investing *MQU* into *NQU*. The negative mitzvot (such as *bal tashchit*) can be viewed as preventing the destruction of *QU*.

[446] R. Yisrael Lifshitz, *Mishnayot HaShalem Tiferet Yisrael* (Jerusalem, [c. 2000], first printed Hanover, 1830 and Danzig, 1843-5). Seder Nezikin II, Avot Mishnah 3:14, *Tiferet Yisrael Boaz Commentary*.

[447] Mishnah Masechta Peah 1:1; B.T. Shabbot 127a; B.T. Kiddushin 39b (ותלמוד תורה כנגד כולם).

considered a *religious duty* in Jewish law, it was an obligation that the Jewish community had to continuously support despite the economic hardships[448].

What exactly falls within the purview of 'Torah education'? In its narrowest sense, Torah education would consist of teaching the canonical works as well as the Talmud and later halachic works. But, 'Torah education' can be defined far more broadly than this. For example, according to R. Simcha Wasserman, the essence of the Torah is to instruct how to use everything in this world for the proper purpose[449]. We can perhaps extrapolate from this that any instruction on how to properly manage natural resources (as long as it does not contradict Jewish law) may be included, as a 'commentary' on a broadly defined Torah education. For example, teaching something as mundane as how to wash dishes with less water, may be included as an extension of 'Torah education', under the category of *bal tashchit*. Similarly, according to R. Aryeh Carmell[450]: *We see that the Rabbis considered the safety of the environment as well within the province of Torah… This is in accord with their view of Torah as the divine law governing man and his environment in the widest sense…It follows that anything which bears on the health and well-being of human beings is ipso facto of spiritual import and within the sphere of Torah.*

Even defined in its narrowest sense, a 'Torah education' has a wider scope than what might normally be thought of as 'religious education'. In fact, a large body of works within the classic Jewish sources encompasses what might today be considered 'environmental education'. This corpus includes hygienic practices[451], preventing damage to others, including the prevention of environmental damage (נזקי שכינים)[452], laws on sustainably settling the land, which give strong emphasis on the importance of planting and maintaining fruit-producing trees (ישוב הארץ) [453], and of course, *bal tashchit*.

Torah education as a religious duty can be divided into two parts. One is imparting *technical* knowledge, as described above, such as teaching how to use resources without violating the prohibition of *bal tashchit*. The second part is *moral-ethical* education which can be considered teaching 'righteousness'. Moral-ethical education includes imparting such concepts as minimizing ones material needs (הסתפקות במועט)[454] and an overall focus on using the material only as a tool for serving the Creator[455].

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[448]Maimonides, Hilchot Talmud Torah, Chapter 2, halacha 1. See also Maristella Botticini and Zvi Eckstein, *From Farmers to Merchants, Conversions, and Diaspora:A Human Capital Interpretation of Jewish Economic History*, 2005, available at http://www.earthinstitute.columbia.edu/cgsd/documents/botticini.pdf.

[449]The author personally heard R. Wasserman say this, although he hasn't found it in print. A somewhat similar quote by R. Wasserman, which was introduced in section 3.3.3 is: *Holiness comes when we live properly with nature. This means that we have to search for the proper purpose for everything we have and to use it for that purpose…If we don't know the purpose for something we need to search for it in the Torah* (R. Akiva Tatz and R. Yaakov Branfman, *Rav Simcha Speaks* (New York,1994), p.108).

[450] Carmell, p.505.

[451] See for example Shulchan Aruch, Choshen Mishpot, section 155.

[452] See for example, B.T. Baba Batra, Chapter 2 (Preventive Environmental Legislation); Maimonides, *Mishneh Torah*, Laws of Neighborly Relations, 10:1; R. Yosef Caro, *Shulchan Aruch*, Choshen Mishpot, 156:4.

[453] See for example Yaakov Zisberg, *Nachalat Yaakov*, *Birurim b'Mitzvot Yishivat Eretz Yisrael* (Mercaz Shapiro, 2005), which is a comprehensive compilation and discussion of the details of the mitzvah of *yishuv ha'aretz*, or dwelling (sustainably) on the land.

[454] See for example R. Yoel Schwartz, *Darcha shel Torah* (Jerusalem, 1981) which is a compilation of classic Jewish sources extolling the minimization of material needs, and proscribing wasteful and luxurious lifestyles as antithetical to Torah values.

[455] An example of this is the previously presented quote (see section 3.3.5) by R. Moshe Chaim Luzzatto in the classic moral-ethical work *Path of the Just*: "If he [man] rules over himself and unites himself with his Creator, and *uses the world only to aid him in the service of his Creator*, he is uplifted and the world is uplifted with him".

In our model, education, including moral-ethical training, is a vital element in increasing man's ability to produce *NQU* (knowledge and righteousness). An important part of this education, from a Jewish perspective, is promoting the repeated and sometimes ritualistic performance of religious duties. According to Jewish tradition, this repeated performance helps to shape a person, as described in the words of the author of the *Sefer haChinuch*[456]:

דע כי האדם נפעל כפי פעולותיו ולבו וכל מחשבותיו תמיד אחר מעשיו שהוא עושה בהם , אם טוב ואם רע ואפילו רשע גמור בלבבו וכל יצר מחשבות לבו רק רע כל היום , אם יערה רוחו וישים השתדלותו ועסקו בהתמדה בתורה ובמצוות , ואפילו שלא לשם שמים , מיד ינטה אל הטוב , ובכח מעשיו ימי ת היצר הרע , כי אחרי הפעולות נמשכים הלבבות (ספר החינוך מצוה ט"ז).

> *Know that a person is driven by his actions, and his heart and all of his thoughts are constantly driven by the actions he does through them, whether for the good or for the bad. Even a completely evil person, if he makes the necessary effort and constantly involves himself in Torah and mitzvot, even if not for the highest reasons, will immediately turn towards the good, and through the strength of his actions he will overcome his evil inclination, because the heart is pulled after the actions [that a person does]*.

Bal tashchit is but one example, very relevant in our case, of this concept. The repeated observance of the principle of *bal tashchit*, aside from any direct benefits to the environment, can be expected to influence a person's (or a society's) behavior vis à vis the world around them. As discussed in chapter three (section 3.1.5), the prohibition of *bal tashchit* is meant to help develop the traits of sensitivity, compassion and self control in its practitioners.

Teaching 'Righteousness'

Education towards what I am calling 'righteousness' plays an important role in the model, but how does a society teach 'righteousness'? This is, undoubtedly, a daunting task for any society. Within the Jewish tradition, one of the goals of a Torah education is to produce what I am calling 'righteous scholars'; people with a high level of both the knowledge and the moral attributes needed to take the minimum possible *MQU* from the physical world and produce the most possible *NQU* for the benefit of others[457]. Other traditional societies also endeavor to transmit certain knowledge, and behavioral norms that they consider 'righteous', in order to produce 'productive' members of that society that minimize the waste of *MQU*. For example, according to the Millenium Ecosystem Assessment (M.A.) report[458]: *Spiritual values were found to act as strong incentives for ecosystem conservation in subglobal assessments in Peru, Costa Rica, India, and some parts of Southern Africa. Educational services of ecosystems assessed in Sweden, São Paulo, and Portugal are all increasing due to growing levels of awareness of the value and benefits of, and thus the demand for, environmental education*.

What seems to be especially lacking in many modern societies is the teaching of 'righteousness' in a clear and unambiguous way. Moral-ethical education traditionally falls within the realm of 'religious training', which has experienced a significant decline in much of the world over the past two centuries or so. For the non-religious and non-traditional, this moral-ethical education needs to be imparted through alternative means. People need to be educated to be less destructive and more appreciative of the natural world.

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[456] *Sefer HaChinuch*, commandment 16, pp.5-6.
[457] This was already illustrated by the Talmudic passage discussed in chapter 4 (section 4.2.3).
[458] M.A. Report, p.120.

While a more detailed discussion of moral-ethical education is beyond the scope of this thesis, I can identify a number of basic moral-ethical principles that need to be imparted in order to teach members of any society to have a more positive influence on their environment. These principles include:

a. Respect and consideration for others
b. Respect for the natural world
c. Appreciation of the natural world, as our life-support system which produces and provides tremendous benefit for man
d. Responsibility
e. Understanding of and appreciation for the longer-term consequences of ones actions
f. Self-discipline
g. Being satisfied with the basic material necessities
h. Recognition and appreciation for the greatness of man

Another important aspect of what I am calling education as a 'religious duty' is *research and development* in order to increase *NQU*, for the benefit of man. This would include medical research, the development of new medical treatments, and research conducted to better understand ecological systems and the services they provide. This would not include such things as research for finding better ways to convince people to meet their emotional needs by consuming more luxury goods.

Aside from education (including research and development as described above), which is usually administered by governmental institutions, it may be possible to include other governmental institutions under the category of *religious duties* as well. According to Jewish tradition, seven *mitzvot*, or religious duties, were assigned to all of humanity. These religious duties, known as the שבע מצות בני נח (seven mitzvot of the offspring of Noah')[459], include the establishment of a judicial system and prohibitions against murder and theft. Administering these 'religious duties' would seem to fall within the realm of governmental institutions. As described in chapter four (section 4.2.3), these institutions can be seen as systems for producing *NQU* for man. This is also consistent with the W.W.O.N. report introduced in the previous chapter which includes in its definition of 'intangible capital': *the sum of knowledge, skill and know-how possessed by the population. It also includes the institutional infrastructure of the country [such as the government and judicial system] as well as the social capital – the level of trust among people in a society and their ability to work together toward common goals*[460].

In the context of this thesis, the goal of religious duties, especially education, is to transform man (once the basic needs described in categories 1 – 3 have been met) into what I am calling *NPC* – a producer of benefits. In other words, the first four categories describe a progression wherein man can develop into a producer of *NQU* to the benefit of himself, his society and the world around him.

[459] See footnote 441 above for a listing of the *7 Mitzvot of the Children of Noah*.
[460] The International Bank for Reconstruction and Development/The World Bank, *Where is the Wealth of Nations? Measuring Capital for the 21st Century*, (Washington, D.C., 2006), p.23.

5. For preserving and enhancing the productive capacity (*MPC*) of the environment

In the Jewish tradition, fruit-producing trees symbolize the productive capacity (*MPC*) of the environment for producing *MQU*. Protecting this productive capacity has great importance and takes precedence over protecting the *MQU* (the fruits) which are next in the scale of priorities (category 6). This is clearly indicated in Deuteronomy 20:19 from which the principle of *bal tashchit* is derived, which stresses that the productive capacity – the fruit-producing tree – must be preserved (*thou shalt not destroy its trees… thou shalt not cut them down*), while the fruits produced by the tree may be consumed (*for thou mayst eat of them*).

The productive capacity or *MPC* includes the production of the 'fruits' themselves, such as food, fiber, wood and pure water - which can be directly consumed for immediate benefits - plus another form of *MQU* introduced in the previous chapter (section 4.1.7.C) as *ecosystem services* – which are the services that the natural environment continuously provides to man. Hawken *et al* write[461]: *While living systems are the source of such desired materials as wood, fish, or food, of utmost importance are the services that they offer, services that are far more critical to human prosperity than are nonrenewable resources. A forest provides not only the resources of wood but also the services of water storage and flood management. A healthy environment automatically supplies not only clean air and water, rainfall, ocean productivity, fertile soil, and watershed resilience but also such less-appreciated functions as waste processing (both natural and industrial), buffering against the extremes of weather, and regeneration of the atmosphere.*

Amongst the ecosystem services that the natural environment provides for man, Hawken *et al* list[462]: *production of oxygen, maintenance of biological and genetic diversity, purification of water and air, storage, cycling, and global distribution of freshwater, regulation of the chemical composition of the atmosphere, maintenance of migration and nursery habitats for wildlife, decomposition of organic wastes, sequestration and detoxification of human and industrial waste, natural pest and disease control by insects, birds, bats and other organisms, production of genetic library for food, fibers, pharmaceuticals, and materials, fixation of solar energy and conversion into raw materials, management of soil erosion and sediment control, flood prevention and regulation of runoff, protection against harmful cosmic radiation, regulation of the chemical composition of the oceans, regulation of the local and global climate, formation of topsoil and maintenance of soil fertility, production of grasslands, fertilizers, and food and storage and recycling of nutrients*.

All these services are produced and provided on a more-or-less continuous basis by the natural environment, when protected from harmful human interference. The principle of *bal tashchit* protects the *MPC* of the natural environment from harmful human interference by prohibiting any degradation of *MPC* except for that which is required to provide for the previous four categories, all the while keeping even permitted degradation to a minimum.

Human-induced changes to the natural environment affecting the *MPC* of the natural environment

Human settlement has long had an impact on the natural environment and its ability to produce ecosystem services[463]. Kareiva *et al.* write[464]: *Humans have so tamed nature that few locations in*

[461] Hawken *et al*., p.3.
[462] Ibid., p.153.
[463] See for example Goudie (2000), whose first chapter discusses the overall history of man's impact on the natural environment, while the rest of the book discusses this impact in more detail.

the world remain without human influence. Global maps of human impact indicate that, as of 1995, only 17 percent of the world's land area had escaped direct influence by humans.

Today, undoubtably, considerably less than 17 percent of the world's land has escaped direct influence by man, and the amount will approach zero as time passes. Even those areas where humans have yet to have direct influence have been affected by anthropogenic influences such as airborne pollutants, and climate change. While some human influence on all of the earth's ecosystems is inevitable, our concern focuses on assessing the costs, in terms of damage to the *MPC*, the affects of this damage on human well-being, and whether the damage is justified according to the principle of *bal tashchit*.

In the words of Kareiva *et al.*[465]: *Conservation has often been framed as the science aimed at protecting nature, and especially protecting nature from people… there really is no such thing as nature untainted by people. Instead, ours is a world of nature domesticated, albeit to varying degrees, from national parks to high-rise megalopolises. Facing this reality should change the scientific focus of environmental science. Instead of recounting doom-and-gloom statistics, it would be more fruitful to consider the domestication of nature as the selection of certain desirable ecosystem attributes, such as increased food production, with consequent alteration of other ecosystem attributes that may not be desirable. Under this paradigm, our challenge is to understand and thoughtfully manage the tradeoffs among ecosystem services that result from the inescapable domestication of nature.*

Judging these tradeoffs often depends on the perspective of the observer. According to Kareiva *et al.*[466]: *If nature is viewed as a bundle of ecosystem services, then domesticated landscapes represent the promotion of certain ecosystem services over others to provide for lower risk, greater productivity, and convenient commerce. The Millennium Ecosystem Assessment summarized the global trends for 16 ecosystem services and reported that two-thirds of those services are currently declining. These declines in ecosystem services are an outcome of selecting and taming nature in a way that leads to increases in food and timber production. To a conservationist interested mainly in biodiversity, we have degraded nature, but to an agronomist, we have altered wild land to make it better serve humans. If one accepts that virtually all of nature is now domesticated, the key scientific and social questions concern future opinions of the type of domesticated nature humans impose upon the world… Some paths of domestication will result in improved ecosystems both for people and for_other species; other paths of domestication will result in ecosystems that are clearly better for humans but not for other species, and some paths of domestication will result in ecosystems that are too degraded to benefit people or other species. The key scientific goals for the study of domesticated nature are to understand what tradeoffs exist between the promotion or selection of different ecosystem services and to determine to what extent we can change a negative tradeoff to a positive one by altering the details of our domestication process. With this understanding will come a science of nature domestication that might guide human activities to minimize the negatives aspects and accentuate the human benefits.*

Kareiva *et al* are perhaps too charitable and optimistic in their assessment of human-impacts on the natural environment. They don't give sufficient emphasis to the human-induced degradation of *MPC* that has resulted from human ignorance or avarice rather than as a result of selecting those services that are more favorable to man and his wellbeing. In addition, they don't account for

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[464] Peter Kareiva, Sean Watts, Robert McDonald, Tim Boucher, "Domesticated Nature: Shaping Landscapes and Ecosystems for Human Welfare," *Science*, vol. 316 (29 June, 2007), p. 1866.
[465] Ibid.
[466] Ibid, p.1869.

serious questions of equity, as described below by the authors of the 2005 *Millennium Ecosystem Assessment* report. While the authors of the MA report acknowledge some of the tradeoffs from man's domestication of nature, they qualify these gains in the following statement[467]: *Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process—in fact, many have been harmed. Moreover, the full costs associated with these gains are only now becoming apparent.*

It is usually very difficult to assess the full extent of the impact to the earth's ecosystems from man's actions, and the effects of this impact on man, in order to judge the tradeoffs. Referring to the MA report, Carpenter *et al* report that[468]: *Relations between ecosystem services and human well-being are poorly understood, and more research is clearly needed to better understand this vital relationship.*

One of the goals of the principle of *bal tashchit*, and the goal of this category in the hierarchy is to maximize and optimize the *MPC* of the environment, and the ecosystem services that the environment can produce for man. Sometimes this will require modifying the ecosystem, so that it produces more-desirable ecosystem services than it would in its natural state, and sometimes this will require protecting the ecosystem in its natural state. In all cases, man needs to optimize ecosystem services to best meet his needs and wants, according to the order of priorities in the hierarchy, while minimizing any damage to the systems producing these services.

Accounting for human ignorance in the preservation of *MPC*

As described in chapter three (section 3.2.2.4), man's ignorance often prevents him from recognizing and appreciating the benefits provided to him by each component of the ecosystem. With the passage of time, man will continue to 'discover' more and more of these benefits. Because of the limitations of man's knowledge of all of the different components (both animate and inanimate) of the earth's ecosystems, of the interrelationships between the different components, and of how all of this affects his wellbeing, there needs to be some sort of 'precautionary principle', to ensure that man will err on the side of the preservation of natural systems and all of their components. This will hopefully help prevent or minimize the destruction of what man will later find to be beneficial, if not vital. The principle of *bal tashchit* contains exactly this element in the limitation *"only the tree* that you know *is not food-producing (MPC) may you destroy*", which restricts the destruction of *MPC*, as described in chapter three (section 3.2.2.2).

Judging the tradeoffs

With the hierarchy presented in this chapter, the tradeoffs become more straightforward. Modification of the ecosystem and the services it produces in a way that degrades the *MPC* is permitted only to meet the needs of the first four categories. As described in section 5.2.2 these categories promote the life, health, dignity of man as well as his ability to produce *NQU*, which is vitally important to man's wellbeing. Increasing *NQU* can be a justification for the limited

[467] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington D.C., World Resources Institute, 2005), p.1.
[468] Stephen R. Carpenter et al, "Millennium Ecosystem Assessment: Research Needs," *Science*, vol. 314 (2006), p.257.

degradation of *MPC* as long as the degradation of *MPC* needed to meet these needs is minimized[469]. Of course, there is a constant feedback loop between *MPC* and man's wellbeing, as described above in section 5.2.2.6, and we need to ensure that the degraded *MPC* doesn't cause a greater loss to the first four categories.

Without such a hierarchy, there needs to be another way to judge between the tradeoffs mentioned above. One alternative is to attempt to judge the tradeoffs on an economic basis, using some form of cost-benefit analysis (which will be briefly discussed in category 6 below). A major limitation with this approach is that many ecosystem services, if represented at all, have not been fairly represented in the conventional market system. According to the MA report[470]: *Most resource management decisions are most strongly influenced by ecosystem services entering markets; as a result, the non-marketed benefits are often lost or degraded. These nonmarketed benefits are often high and sometimes more valuable than the marketed ones. For example, one of the most comprehensive studies to date, which examined the marketed and nonmarketed economic values associated with forests in eight Mediterranean countries, found that timber and fuelwood [which are marketed] generally accounted for less than a third of total economic value of forests in each country. Values associated with non-wood forest products, recreation, hunting, watershed protection, carbon sequestration, and passive use (values independent of direct uses) accounted for between 25% and 96% of the total economic value of the forests…The total economic value associated with managing ecosystems more sustainably is often higher than the value associated with the conversion of the ecosystem through farming, clear-cut logging, or other intensive uses. Relatively few studies have compared the total economic value (including values of both marketed and nonmarketed ecosystem services) of ecosystems under alternate management regimes, but some of the studies that do exist have found that the benefit of managing the ecosystem more sustainably exceeded that of converting the ecosystem.*

Other attempts to put a monetary valuation on the traditionally non-marketed *ecosystem services* provided by the environment have claimed far more dramatic economic benefits from preserving natural ecosystems than those described in the MA report. For example a study published by Constanza *et al*, in 1997 estimated that the total benefit provided for man by the world's natural ecosystems (most of them non-marketed) amounted to at least 33 trillion [10^{12}] dollars per year[471]. This was almost double the total global GNP for that year – which amounted to approximately 18 trillion dollars. Constanza's study claims a benefit to cost ratio of greater than 100 to 1 in favor of the preservation of the world's ecosystems, rather than consuming them for the marketed resources they could more immediately provide.

Similarly, Miller writes[472]: *According to one calculation, a typical tree provides $196,250 worth of ecological benefits during its lifetime – in the form of oxygen, air purification, soil fertility and erosion control, water recycling and humidity control, and wildlife habitats. Sold as timber, the same tree is worth only about $590. Even if such estimates are off by a factor of 100, the long-term ecological benefits of a tree still clearly exceed its short-term economic benefits.*

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[469] Section 3.2.3 discussed the obligation, even where degradation is permitted, of minimizing the degradation wherever possible, such as by limiting the degradation to the least productive parts of the ecosystem, or to transplant or transfer or otherwise replace what was degraded.

[470] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*. (Washington D.C., 2005), p.6.

[471] Robert Constanza, d'Arge, *et al*, "The value of the world's ecosystem services and natural capital," *Nature*, vol. 387 (May 15, 1997), pp 253-260.

[472] Miller, p. 341.

These attempts to put a market value on ecosystem services demonstrate that these services are extremely valuable and are usually worth far more than any marketed resources that can be unsustainably harvested from the same ecosystem. The true value of these services is also very difficult to quantify in monetary terms. With our hierarchy, *MPC* (the producers of ecosystem services) is protected without trying to assign it, or the services produced, a market value. Economic analysis is used in a more acceptable form, for the assessment of the costs and benefits of marketed goods and services, as described below.

6. Using surplus MQU for meeting non-essential human needs and wants, as long as the benefits exceed the costs

Once the above needs in the hierarchy (categories 1 – 5) have been met, the next and final stage is assuring that the consumption of 'surplus' *MQU*, or material resources is not done in a wasteful manner[473]. In other words, to ensure that the benefits exceed the costs. This is derived from the concept of *m'uleh b'damim* (choosing the option bringing the greatest economic benefit) described in chapter three (section 3.2.2.5D). The requirement to ensure that benefits exceed costs finds modern expression in the discipline of *cost-benefit analysis*.

Brief description of cost-benefit analysis

Economists Seneca and Taussig describe cost-benefit analysis as[474]: *The systematic appraisal of all benefits and all costs of a contemplated course of action in comparison with alternative courses of action (always defined to include no action at all as one alternative). The cost-benefit criterion for whether to undertake a given course of action is that the additional benefits to be derived from taking the action exceed the corresponding additional costs. In even simpler terms, this criterion means that the course of action be undertaken only if the sum of all the expected advantages outweighs the sum of all the expected disadvantages.*

Watkins[475] provides a short history of cost-benefit analysis (CBA): *Cost-benefit Analysis estimates and totals up the equivalent money value of the benefits and costs to the community of projects to establish whether they are worthwhile…The idea of this economic accounting originated with Jules Dupuit, a French engineer whose 1848 article is still worth reading. The British economist, Alfred Marshall, [provided] some of the formal concepts that are at the foundation of CBA. But the practical development of CBA came as a result of the impetus provided by the Federal Navigation Act of 1936. This act required that the U.S. Corps of Engineers carry out projects for the improvement of the waterway system when the total benefits of a project to whomsoever they accrue exceed the costs of that project. Thus, the Corps of Engineers had to create systematic methods for measuring such benefits and costs. The engineers of the Corps did this without much, if any, assistance from the economics profession. It wasn't until about twenty years later in the 1950's that economists tried to provide a rigorous, consistent set of methods for measuring benefits and costs and deciding whether a project is worthwhile.*

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[473] B.T. Baba Kama 91b – See chapter three (section 3.2.2.5D).
[474] Joseph J. Seneca and Michael K. Taussig, *Environmental Economics*, 3rd ed. (New Jersey, 1984), p. 10.
[475] Thayer Watkins, *Introduction to Cost Benefit Analysis*, San Jose State University Economics Department, on website: http://www2.sjsu.edu/faculty/watkins/cba.html.

An in-depth comparison between the concept of *m'uleh b'damim* (MB) and modern-day cost-benefit analysis (CBA) is beyond the scope of this thesis. Nevertheless, several important points can be made here about the similarities and differences between the two.

Both MB and CBA share some of the same intrinsic limitations. These include:

- An imperfect knowledge of benefits as well as of costs. It is impossible to assess every benefit and every cost and sometimes only a rough estimate can be made.

- Uneven distribution of benefits and costs are not taken into account. Sometimes the benefits can accrue to one party and the costs to another party, leading to equity issues.

One of the important differences between the principle of *bal tashchit* and CBA is how the two deal with non-marketed factors such as the preservation of human life, health and dignity, performance of religious duties, and the production of ecosystem services. Whereas CBA attempts to put a price on these factors in order to include them in the calculations, the *bal tashchit* approach described here keeps them separate. In addition, the *bal tashchit* approach places these non-marketed factors higher in a hierarchy of needs than economic considerations. This helps to assert the primacy of human life, health and dignity as well as the performance of religious duties, and production of ecosystem services. This also avoids the thorny problem of assigning a monetary value to these essential areas of life. In essence, this puts cost-benefit analysis in its place as an important tool for decision making within a much more limited scope of operation.

Another related issue is the *discounting* of the future. CBA normally discounts the future, and depending on the discount rate chosen, this can play a determining role in the outcome of the analysis. Using a high discount rate puts little value on sustainability by minimizing the long-term future consequences of present actions. On the other hand, the use of a zero or very low discount rate for CBA, which would seem to favor sustainability, is unusual and quite controversial. For example, in his recent report on economic effects of climate change, British economist Nicholas Stern proposes using a very low discount rate – as an ethical obligation towards 'intergenerational neutrality' when calculating the future costs of damage from climate change[476]. American economist William Nordhhaus criticizes Stern's usage of a 'near-zero' discount rate as impractical and even counterproductive, charging that it can lead to scenarios where preventing relatively insignificant but enduring future damage would exact an absurdly large cost from present and future generations[477]. By separating *MPC* as a higher category in the hierarchy, the principle of *bal tashchit* largely avoids the thorny problem of assigning a discount rate to the production of ecosystem services[478], such as the climate system.

It would seem that CBA plays a more limited, but on the other hand more obligatory, role in *bal tashchit* than in conventional resource management in the modern world.

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[476] Nicholas Stern, *The Economics of Climate Change: The Stern Review*, (Cambridge, 2007), available at: http://www.hmtreasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm.

[477] See William Nordhaus, *The Challenge of Global Warming: Economic Models and Environmental Policy* (New Haven, 2007) pp. 143-161 for a detailed description of his criticism.

[478] As described in section 3.2.2.5D, there is no clear indication on whether to use discounting of the future in MB. If discounting is used, is would be used for *MQU*, but probably not for *MPC*.

Where CBA applies in the *bal tashchit* approach – at the bottom of the hierarchy – it is *obligatory* upon everyone, at all times. On the other hand, in the 'world-at-large', CBA is usually viewed as a useful but *non-obligatory* decision-making tool[479].

Ensuring a sufficient flow of resources for economic health

Economic health is also an important human need. Even though economic efficiency is placed at the bottom of the hierarchy, in category 6, it is also a need that must be provided for – sometimes at the cost of degrading resources. In fact, with most resources (as will be illustrated with the example of water in the next chapter), meeting the basic human needs in categories 1 through category 4 can be accomplished with only a small fraction of the total available resources. Category 5 (preserving the *MPC* of the natural environment) often has considerable flexibility in the amount of resources demanded. Experience shows that many ecosystems are resilient and can be neglected or abused for a limited period of time and still bounce back to a healthy and productive state[480]. Therefore, in times of need – where economic performance is inadequate to meet the current needs of the population, or while a society is in the first or second developmental stages, struggling to reach the third stage (see chapter four, section 4.5) – additional resources may need to be temporarily 'borrowed' to category 6 to increase economic activity.

Another related factor has to do with the substitution of resources – meeting human needs and wants by substituting more effective, less expensive and/or more available objects or materials for that which what was previously consumed to meet these needs and wants. Whereas substitution is limited in satisfying many of the basic human needs described in categories 1-5, (for example, there is no practical substitute for clean water for drinking, food preparation and basic hygiene) there is considerable room for substitution in most non-essential economic activities. In fact, finding and developing substitutes is one of the most common applications of *NPC* (in the form of research and development) in the modern world. Industry has changed dramatically since the beginning of the industrial revolution, and can utilize a wide and rapidly growing pool of synthetic materials, whereas the resources used to meet basic human needs have changed considerably less over history. Therefore, where specific resources are needed to meet basic human needs as well as for other, non-essential industry, it is usually easier for industry to find substitutes for these resources, as required by the hierarchy. For example, for millennia, wood was the primary fuel used in most of the world for cooking and heating – basic human needs – as well as for industry. With the beginning of the industrial revolution, the demand for fuel skyrocketed, as wood was now in great demand for fueling the early steam engines used by industry and transportation. Industry was able to find substitute fuels (first coal, and later oil) to replace wood – which still remains in parts of the developing world as a primary fuel for meeting basic human needs.

[479] See for example: Nick Hanley, "Cost-benefit analysis of environmental policy and management," *Handbook of Environmental and Resource Economics*, ed. Jeroen C.J.M. van der Bergh (Cheltenham, U.K., 1999), pp.824-834.
[480] Andrew Goudie, *The Human Impact on the Natural Environment*, 5th ed. (Cambridge, MA, 2000), p. 431.

5.3 The role of additional considerations in the principle of *bal tashchit*

There are additional considerations – not directly discussed in the hierarchy above – that often play a role in resource management. This section examines these factors in relation to their possible influence on the application of the principle of *bal tashchit*.

5.3.1 Influence of societal values and norms

The principle of *bal tashchit* – particularly through its emphasis on moral-ethical education (as described in section 5.2.3.4) – encourages the development of a frugal, conservation-minded society. In the previously-quoted (chapter four, section 4.2.3) words of R. Aharon Lichtenstein[481]: *Jewish morality stands firmly on a base of self-control, frugality and restraint. Without this foundation, all of the ecological measures in the world will be in vain.*

R. Lichtenstein makes another important point in this statement. The success of conservation measures is largely dependent on the deep-seated values and behavioral norms of a society. Unless these are consistent with the goal of conservation measures, there is little long-term chance for success. For example, in 1975 – during the OPEC oil embargo – the United States instituted the *Corporate Average Fuel Economy* (CAFE) standards requiring auto manufacturers to increase the fuel efficiency of the cars they produced from 18 to 27.5 mile per gallon, in the period of time between 1978 and 1985[482]. This conservation measure was not consistent with the relatively extravagant values and norms of American society of the late twentieth century. Once oil prices declined – from the 1980's through the rest of the century, the CAFE standards were either ignored or bypassed by new classes of vehicles not restricted by the CAFÉ standard, such as the 'sport utility vehicles' (SUV's) which became popular in the U.S. in the 1990's despite their poor fuel efficiency.

The values and behavioral norms of a society can change, but the change is often reversible, depending on external circumstances. The principle of *bal tashchit* – especially for those who consider *bal tashchit* to be a Divinely-mandated law[483] – promotes conservation-minded values and norms that can be expected to remain stable independent of external circumstances.

Individually-owned resources

A *related* aspect of the principle of *bal tashchit* is that it clearly prohibits the waste of even *one's own* resources. While the values and norms, as well as the laws of other societies may prohibit the waste of resources belonging to others, or of publicly-owned resources, one may generally do as they please with their personal property as long as it is not perceived to harm others. In the words of R. Jonathan Sacks, Chief Rabbi of the British Commonwealth[484]: *{...} one of the things that my ownership [of an object such as a drinking glass] consists of is that I*

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[481] R. Aharon Lichtenstein, "Man and Nature – the Social Aspect," in: *Judaism in our Modern Society*, Israel Ministry of Education, Branch for Religious Culture, (Jerusalem, 1971), p. 108.
מוסר היהדות עומד איתן על בסיס של ריסון, הסתפקות והתאפקות. בלא בסיס זה יהיו לשווא כל האמצעים האקולוגיים שבעולם.

[482] Julian Simon, *The Ultimate Resource* (Princeton, 1996), p. 288.

[483] This applies to Torah-observant Jews who believe that the Torah, and the Jewish law derived from the Torah are of Divine origin and not subject to the whims of social change.

[484] R. Jonathan Sacks, *Creation – Where did we come from?*, unedited transcript of Lecture on 6 February, 2001. available at http://www.chiefrabbi.org/faith/creation.html.

can do with it what I like. So long as I do not harm anyone else … Therefore, in English law, one of the essential features of my ownership is that I should be able to smash it and break it. That is part of ownership … to do that is forbidden in Jewish law under the environmental imperative known as bal tashchit. *I do not in Jewish law own this glass to the point at which I can smash it destructively because that is disobeying the command, Thou shalt not destroy.*

Lavish spending for luxuries is also proscribed by the principle of *bal tashchit* (see chapter three, sections 3.14 and 3.15), which mandates directing surplus wealth into the production of *NQU*, as described above (see section 5.1.2).

5.3.2 Ethical Considerations

Ethics has been described as 'obedience to the unenforceable'[485]. In other words, ethics enters into the realm of what society believes is correct but can not or will not legislate and/or enforce. Ethical considerations play an important role in the principle of *bal tashchit*[486]. Any unnecessary waste or destruction would be considered unethical, even where it might be permitted by strict application of Jewish law. For example, for those who take the position that the prohibition of *bal tashchit* only applies to objects with measurable economic value (see chapter three, section 3.2.2.4), it would still be considered *unethical* to needlessly waste *even a mustard seed*[487] which is lacking any economic value. Social equity issues, such as the asymmetry between individuals or different segments of society, or between different societies, in sharing the benefits and costs from activities affecting the natural environment, are not directly addressed by the principle of *bal tashchit* and need to be addressed through other means.

5.3.3 Ecological Considerations

The principle of *bal tashchit* does not view ecological considerations *independently* of the welfare of man[488]. The environment is man's life-support system. To the extent that ecological considerations affect the life, health, or dignity of man, his ability to perform religious duties, the ability of the environment to produce *MQU* for man, or man's economic well-being, then these considerations merit the protection provided by the principle of *bal tashchit*, as described in categories 1 - 6 above. This position is in opposition to some current beliefs such as 'deep ecology' which assign nature a value of its own, independent of man. Freeman, Pierce and Dodd write[489]: *Deep ecology environmentalists ground their position in a basic tenet of biology: Homo sapiens are animals and as such are part of nature and depend upon nature for our very existence. Deep ecology environmentalists challenge the belief {…} that humans are fundamentally different and distinct from the rest of nature, and somehow exempt from its laws … the centric ethical principle of deep ecology is biocentric equality. All parts of the earth's various ecosystems – all life – has equal inherent value and thus an equal right to live and flourish… Deep ecology denies the superiority of the human species; all life is of equal value.* As described in section 5.2.3.3, a

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[485] Lord John Fletcher Moulton, *Law and Manners, Atlantic Monthly* (July 1924), p.82.
[486] See, for example, appendix A., which describes what might be called the basic ethical principles upon which *bal tashchit* is based.
[487] *Sefer HaChinuch*, commandment 529, pp. 647-648.
[488] See section chapter three (section 3.2.2.4). On this point, I disagree with the position of Boersema who writes (Leiden 2001, p. 246): "The earth does not exist for the sole benefit of humankind, and our species does not constitute the purpose of creation…In the cosmology of the ancient Israelites, nature has a 'value of its own', a value that does not derive from nature's significance to human society."
[489] R. Edward Freeman, Jessica Pierce and Richard H. Dodd, *Environmentalism and the New Logic of Business* (Oxford, 2000), pp. 73-78

fundamental part of Jewish tradition, which encompasses the principle of *bal tashchit*, is the separation and elevation of man over other forms of life[490].

5.4 Summary

In this chapter, I have attempted to construct a model of the principle of *bal tashchit* that can be applied to current problems in resource management. I began the model with a listing of goals and objectives for managing resources according to the principle, based on my understanding of *bal tashchit* from the previous chapters.

A key feature of this model is the development of a hierarchy of human needs for *QU*, derived from classic Jewish sources, which helps serve as a guide for using resources according to the principle of *bal tashchit*. While much of the hierarchy appears to be consistent with the modern western values, there are a few exceptions, as will be summarized below.

The importance given to human life and health (categories one and two in the hierarchy) appears to be consistent with modern western values. On the other hand, the importance given to human dignity, as we have defined it, (the third category of the hierarchy), appears to be an exception – particularly in light of the erosion of both the sense of distinction and elevation of man over other life forms in some segments of modern western society. Examples of this erosion include the concepts of 'deep ecology', and the 'animal rights movement' for whom the philosopher Peter Singer, quoted above in section 5.2.3.3, is a well-known exponent. Jewish tradition stresses the importance of these distinctions. In addition to the intrinsic dignity of man, by virtue of his being created in the image of the Creator, Jewish tradition apportions dignity according to the ability of the individual to benefit others. While other also value beneficence, I'm not sure that this is commonly linked with human dignity. Emphasizing the importance of dignity, as I have defined it, is also emphasizing the importance of benefiting others, which plays an important role in promoting man's production of *NQU*.

Another departure from modern western values is the great importance this model gives to education, particularly moral-ethical education, as a 'religious duty' (category four in the hierarchy). While formal education has only recently (over the past century) become a recognized 'right' for all, in most of the world, moral-ethical education seems to be on the decline. In this model, moral-ethical education – training for 'righteousness' - is imperative, and must be provided to all members of society.

Chapter 4 (section 4.2.3) discussed the crucial importance that *NQU* plays in the welfare of man and his relationship to the environment. The first four categories in our hierarchy express a progression of the development of man as a producer of *NQU*. The hierarchy places this human development in a higher position than the protection of the environment itself. The reason for this is the assertion that – in the modern world at least – the long-term protection of the environment is dependent on human development. In particular, long-term environmental protection is dependent on the wide-spread development of certain traits such as self-restraint, responsibility, and respect and consideration for the natural world (see section 5.2.3.4).

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[490] This is sometimes referred to, in modern terms, as the 'Human Exceptionalism Paradigm' or HEP. See: Gary W. McDonald, Murray G. Patterson, "Bridging the divide in urban sustainability: from human exceptionalism to the new ecological paradigm", *Urban Ecosystems*, vol. 10 (2007), pp.169-192 for a detailed description of HEP.

The protection of *MPC* takes the next position in the hierarchy (category 5). Man has had a long and growing impact on the natural environment. Much of this impact has had a negative effect on the ability of the environment to produce ecosystem services that contribute to man's life and wellbeing. In all of man's interactions with his environment, there are tradeoffs between the welfare of different societies, different groups within a society, and between different components of the environment, with asymmetric benefits and costs between the different groups. Much of the astounding material progress over the past 200 years was accomplished at the expense of the productive natural environment. Western society needs to reevaluate these tradeoffs. Fortunately, as evidenced by the Millennium Ecosystem Report and other recent studies, there is a growing consensus of the need to do this and better protect the environment, and where possible, repair the damage. This consensus has been spreading from the western world to encompass even the rapidly developing countries such as China and India where environmental problems are, perhaps, the most acute.

The goal of category five is to optimize the production of *MQU* for man according to his needs and wants, in a sustainable way. This may require modifying the natural environment in some cases. In almost all cases we are looking at tradeoffs between modifying the environment in ways that will produce benefits for some people versus the negative effects to the environment and to some people.

Whereas modern society often attempts to put a market price on all things important, our hierarchy avoids the use of economic valuations of market values on the first five categories. This does not mean that within each category economic forces are not used to help determine the most efficient means for apportioning and using resources. It does mean that economic forces are used in their more conventional way, on things that are normally marketed.

The next chapter will attempt to apply this model of the principle of *bal tashchit* to a current environmental problem – the management of fresh water resources. In addition, I will make a few observations on how the principle of *bal tashchit* may be applied to two other types of problems – climate change and loss of biodiversity.

Chapter 6. Application of the principle of *bal tashchit* to the management of the natural environment

This chapter will examine the theoretical application of the principle of *bal tashchit* to three environmental problems. Section 6.2 will examine, in depth, the application to the water shortage in Israel. Section 6.3 will examine more peripherally how the principle of *bal tashchit* might be applied to two other problems: climate change and the loss of biodiversity.

6.1 Current overall state of environment

The Millennium Ecosystem Assessment (M.A.) report, which was introduced in chapter four, presents extensive evidence of the degradation of ecosystem services[491] that has taken place as a result of the human influence on the environment. While acknowledging significant gains to human well-being from these changes, the authors qualify these gains in the following statement[492]: *Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process—in fact, many have been harmed. Moreover, the full costs associated with these gains are only now becoming apparent.*

The following are some of the other findings from the study: *Approximately 60 percent (15 out of 24) of the ecosystem services evaluated in this assessment (including 70 percent of regulating and cultural services) are being degraded or used unsustainably. Ecosystem services that have been degraded over the past 50 years include capture fisheries, water supply, waste treatment and detoxification, water purification, natural hazard protection, regulation of air quality, regulation of regional and local climate, regulation of erosion, spiritual fulfillment, and aesthetic enjoyment.*[493] *The full costs of the loss and degradation of these ecosystem services are difficult to measure, but the available evidence demonstrates that they are substantial and growing*[494].

As the M.A. report reports, there has been significant and alarming degradation of the producers of ecosystem services, or what I am calling *MPC*, particularly over the past few decades, accompanied by *substantial net gains in human well-being and economic development.* The key question, from the perspective of *bal tashchit*, which the M.A. report doesn't address, is whether the degradation of *MPC* as well as the reported harm to people in some regions has been justified by the overall gains in human welfare as well as the ability to deal with current and future problems (what I am calling *NQU* and *NPC*). This issue will be only touched upon in the end of this chapter, and further addressed in chapter seven.

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[491] As discussed in chapter 4 (section 4.1.7.C) the M.A. report divides the world's ecosystem services into the following categories: *Supporting services* – such as nutrient cycling, soil formation and primary production (photosynthesis); *Provisioning services* such as food, water, timber and fuel; *Regulation services* – such as climate regulation, flood regulation, disease regulation and water purification; *Cultural services* – such as aesthetic, spiritual, education and recreational.

[492] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*. World Resources Institute, (Washington D.C., 2005), p.1.

[493] Ibid, p.6.

[494] Ibid, p.1.

6.2 Theoretical application of the principle of *bal tashchit* to the water shortage in Israel

Water may be the natural resource of greatest importance to man. Human survival and the wellbeing of society depend upon a constant supply of water of sufficient quantity and purity. Water is also, arguably, the most heavily used and one of the most poorly-managed resources on the planet. As a result, there is great concern over the availability of sufficient water supplies to many regions of the world. In the words of Goldin and Roland-Holst[495]: *water is a distinctive resource because it constitutes a direct input to almost every economic activity, drawing a continuous thread from primary use in agriculture, through manufacturing, and into the myriad of service sectors. Despite a long economic history, water allocation stands out as one of the most significant cases of market failure in both developing and developed economies.*

The institutional arrangements which have governed water allocation have fostered serious resource misallocation, technological choice which is neither statically nor dynamically efficient, and an array of negative economic and environmental externalities which propagate through downstream linkages to the rest of the economy.

As Goldin and Roland-Holst emphasize, water resources have been severely mismanaged in both developed and developing economies. This mismanagement has resulted in significant, and often preventable harm to both man and his environment.
According to the M.A. Report[496:] *Some 1.1 billion people still lack access to improved water supply, and more than 2.6 billion lack access to improved sanitation. Water scarcity affects roughly 1–2 billion people worldwide. Since 1960, the ratio of water use to accessible supply has grown by 20 percent per decade.*

This section will begin with a focus on water as a general carrier for *MQU*. The remainder of section 6.2 will focus on one type of *MQU* frequently associated with water – water purity – and discuss the management of pure or high quality fresh water (HQFW) in Israel. At the end of section 6.2, I will discuss how the principle of *bal tashchit*, as described in the previous chapters, might be applied to the management of Israel's HQFW.

[495] Ian Goldin and David Roland-Holst, 'Economic policies for sustainable resource use in Morocco', *The Economics of Sustainable Development*, (Cambridge, 1995), p. 175.
[496] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*. World Resources Institute, (Washington D.C., 2005), p.13.

6.2.1 Unique Properties of Water

Water has the following unique properties that make it a particularly interesting resource in regards to resource management and the principle of *bal tashchit*:

1. Water is extremely ubiquitous. Approximately 70% of the earth's surface is covered by water. Water is a component of all living matter and almost every known substance on earth. Water is constantly cycling through man and his environment.

2. Water is an unusually safe and benign substance, with a very low toxicity[497].

3. Water is of critical importance to man. By weight, water makes up approximately 60 percent of the adult human body and 83 percent of blood. To maintain life and health, each human must replace between 2 and 4.5 liters of water per day.[498]

4. Water is a polar solvent that dissolves and carries in solution a wide variety of other substances. Wherever water goes in a system, either through the human body or through the environment, it usually carries with it a variety of materials which can include nutrients and electrolytes being transported to where they are needed in the system and wastes being removed from where they are harmful to the system.

5. Water is a very dynamic substance that can exist in a solid, liquid and gaseous state within the earth's ecosystem. Water is easily polluted and can be relatively easily purified, such as by evaporation and condensation.

6. Water has a high capacity for absorbing and storing energy. This is crucial for regulating the temperature within a living organism, within man-made structures and within the earth's ecosystem.

7. Water, as a multi-purpose resource, is used in some capacity in almost every human activity. Water has an astoundingly wide variety of uses in almost every sphere of human existence[499]. As just one small example: the normal household usage of tap water includes drinking, bathing, food preparation, washing dishes, laundering, scrubbing floors, watering plants and flushing toilets.

In essence, water is used in almost every human activity and provides tremendous, constant benefit to man.

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[497] Water can, however, be toxic in very high doses or under certain pathological conditions. For more information on water intoxication see H.A.C. Kamphuisen and M.S. Mourtazaev, 'Water Intoxication', Chapter 16, in *Handbook of Clinical Neurology*, Vol. 20 (64): *Intoxications of the Nervous System*, Part 1, F.A. de Wolff, editor, (Elsevier Science B.V. 1994), pp. 239-244.

[498] Peter H. Gleick, 'Basic Water Requirements for Human Activities: Meeting Basic Needs', *Water International*, 21 (1996), p.84.

[499] As another example, many important physical parameters with which man measures his environment – such as temperature (°C), calories and pH are based on the physical properties of water.

6.2.2 Water and *MQU*

Water is a substance which well illustrates my description (introduced in chapter four) of a *resource* as: *QU* incorporated into matter and energy. Water's value is almost entirely defined by the *MQU* it carries. For example, polluted water carries *negative MQU* and usually has negative value. Additional *QU* (in the form of knowledge and energy) must be invested in order to purify polluted water so that man can benefit from it. On the other hand, pure water carries positive *MQU* and is an indispensable resource for man, although its monetary value does not necessarily reflect its vital importance to man (as discussed in chapter three, section 3.2.4.D). This concept can be further illustrated with the following examples of how water transports *MQU* to where it is needed and how water removes *negative MQU* from where it is not needed.

Water transport of *MQU* to where it is beneficial to man

There are two main ways that water transports *MQU* to benefit man. First of all, because of its ability to dissolve and absorb other substances, water dissolves and transports nutrients and other vital substances to where they are needed in an organism. For example, water dissolves many minerals and other soil nutrients which it transports into the roots of plants, from where they are transported through the vascular bundles and distributed (in the sap, which is mostly water) to the different parts of the plant. In a similar way, water – as the principle constituent of blood – transports *MQU* in the form of nutrients, hormones, oxygen, blood cells (such as erythrocytes, leukocytes and thrombocytes) to the cells and organs of the body of man and other higher animals.

The second way that water transports *MQU* to benefit man is through energy storage and transfer. Because of its effectiveness in absorbing and carrying energy, water is widely used for transferring energy in many thermal processes. For example, in power stations, water is commonly used to absorb and transform heat energy from a heat source (combustion or nuclear reactor) to mechanical energy (in the form of steam) to turn turbines in order to generate electricity. Similarly, water stores and carries gravitational energy and then releases it in the form of hydropower. Water is also extensively used for heating (for example, in heating homes and other buildings). In all of these cases, water absorbs energy from a source and transports and releases the energy in a form and location where it is needed.

Water transport of *negative MQU* from where it is detrimental to man

Water removes *negative MQU* from where it is detrimental to man through two main mechanisms. First, because of its ability to dissolve other substances, water is used to dissolve and remove waste materials. Internally (in the form of bodily fluids such as blood) water removes waste materials from the cells and organs, transferring them to the urine with which the waste materials are excreted from the bodies of living organisms. Externally, water is universally utilized as a cleaning fluid for removing unwanted material from a wide variety of objects.

Second, because of its ability to absorb, transport and release large amounts of heat energy, water is used as a coolant and heat regulator, absorbing and removing excess heat from living organisms (for example, through evaporative cooling by means of perspiration), as well as from mechanical objects such as heat engines. Similarly, water helps stabilize the earth's climate by removing excess heat during summer (by evaporation, which absorbs tremendous amount of heat from environment), and by releasing heat during the winter.

Resource	***MQU* to be managed** (in addition to the water itself)	**Utility from *MQU***	***System (MPC) that produces the MQU*:**
Pure water (HQFW)	Purity	Drinking, food preparation, cleaning, manufacturing	Natural: hydrological cycle Man-made: water purification systems
Hot water or steam	Energy (heat, or mechanical)	Heating, cooking, bathing, energy generation	Combustion of fossil fuel, electricity, solar energy, nuclear energy
Elevated water	Energy (potential)	Hydro power (generation of electricity, mechanical work)	Elevating water to a higher level, such as by precipitation in mountainous areas
Cold water	Negative energy (heat removal)	Cooling – removal of excess heat.	Natural or man-made cooling processes
Water as a necessary component for life	Water itself	Water as a necessary structural component of living and non-living matter. For example, as a structural part of plant cells, enabling the production of food and fiber. Water enables life.	Natural: hydrological cycle; Man-made: irrigation

Table 6.1 Types of MQU carried by and managed on water

6.2.3 Focus on the management of purity in water

Human beings must regularly consume water in order to survive. Because water is so ubiquitous and because it acts as a universal solvent, water commonly comes into contact with and carries substances or organisms that may be harmful to human life. To be safe for human consumption, water must be sufficiently pure of harmful substances or organisms. Worldwide, a lack of pure water accounts for millions of fatalities and many more illnesses each year. Water expert Peter Gleick writes that preventable water-related diseases kill an estimated 10,000 to 20,000 children every day[500]. According to the United Nations Environmental Program (UNEP), approximately 25,000 people die each day as a result of poor water quality and waterborne diseases, which represent the single largest cause of human sickness and death world-wide[501].

One recent example of the serious affects from a lack of pure water is the high incidence of skin disorders ('blackfoot' disease), cancer and neuropathy in Bangladesh, as a result of arsenic-contaminated well-water[502]. In this case, tube wells were widely introduced in the country in the

[500] Peter H. Gleick, 'Making Every Drop Count', *Scientific American*, February, 2001, p. 29.
[501] United Nations Environmental Program, *Global State of the Environment Report 1997*, Executive Summary, Overview of Regional Status and Trends, p. 2.
[502] See, for example: http://www.who.int/water_sanitation_health/dwq/arsenic/en/.

1970's in an attempt to improve the availability of clean water to the populace – many of whom previously had to rely on contaminated surface waters for their drinking water. Unfortunately, in this case the cure was worse than the disease. Arsenic (a toxic substance naturally occurring in the sediments through which the groundwater flowed) was absorbed in the well-water and ingested by millions of unsuspecting victims who presumed they were drinking safe water. An estimated 35 to77 million people, out of a total population of 125 million, are currently exposed to arsenic through drinking water, which is also the major cause of death in Bangladesh, especially among children[503]. This case illustrates both the importance and the difficulty in providing sufficiently pure drinking water for many parts of the globe.

In general, the purer the water, the more benefit and utility it can provide for man[504] and therefore, the higher the level of *MQU* it carries[505]. Purifying water adds *MQU* to the water. On the other hand, most human uses of water result in the mixing of water with other substances – which lowers the purity, and therefore, ultimately, lowers the *MQU* carried by the water.

[503] A. Vahidnia, G.B. van der Voet and F.A. de Wolff, "Arsenic Neurotoxicity - A Review", *Human and Experimental Toxicology* 26 (2007) p.825; available at: http://het.sagepub.com/cgi/content/abstract/26/10/823.

[504] Interestingly, plant life (producers) often play a complementary role to human and animal life when it comes to *MQU* in the form of purity. Producers feed on what I consider *negative MQU* (such as human and animal wastes - including carbon dioxide and organic waste materials) from which they produce (with the help of photosynthesis) food and fiber as well as oxygen, all of which provide *MQU* to man. In addition, as they (with the help of decomposers) remove human and animal waste materials from water, producers also perform an important role in purifying, and therefore increasing the *MQU* of the water for man.

[505] This is only true up to a point. Demineralized water or distilled water (which is the purest available form of water) is actually less beneficial to man (when directly consumed) in terms of promoting life and health than high quality 'natural' water which contains some beneficial minerals, and is therefore, less pure. Demineralized or distilled water also has a lower pH, and is more corrosive to plumbing and more likely to leach harmful materials such as heavy metals from the surrounding environment than 'natural' water. Man needs and commonly ingests a number of important minerals such as calcium and magnesium that are naturally present in the water he consumes. These minerals, in low concentrations, can also be considered a form of *MQU* carried by water.

Defining purity as *MQU*

Purity is an unusual form of *MQU*. *MQU* is usually incorporated into matter or energy until it is degraded, or consumed from the matter or energy to provide benefit. For example, heat energy carried on water circulating in a radiator helps to heat a room in the winter for human benefit. Purity, on the other hand, is essentially the absence of contaminants (including physical, chemical or biological contamination) – a necessary condition for water to be safely consumed, or used for other important purposes. Purity can be considered an 'enabler' for water to provide its benefits to man without harmful effects, rather than as a separate entity. In this light, perhaps purity should be considered in conjunction with water itself as a form of *MQU*, with the degree of purity determining the level of *MQU* the water can provide. My investigation will focus on this combination of purity in conjunction with water – which I am calling high quality fresh water (HQFW).

When discussing water shortages in much of the world, the most critical shortage is often not the water itself – which may be quite abundant in the form of salt or brackish or polluted water – but rather, the *MQU* (purity) of the water, as I will discuss below.

Purifying Water – *PC* for *MQU*

Purifying water is usually an energy-intensive process. With sufficient energy, virtually any water can be purified to high quality fresh water (HQFW). There are two principal ways in which water is purified:

Natural purification

Water is naturally purified through the hydrological cycle (see Figure 6.1). In this process, energy from the sun evaporates surface water (primarily from the oceans). The water vapor rises and collects in the atmosphere where it condenses – often forming into clouds. Clouds eventually release the condensed water vapor – in the form of precipitation – which is carried by gravity back to the surface of the earth. During this process, the sun's energy purifies (through distillation) the water and also redistributes it – for example from the oceans to the land, where it is more accessible and beneficial to man. The hydrological cycle is the primary source of HQFW. It is estimated that the world receives approximately 500,000 cubic kilometers of HQFW each year[506] through the hydrological cycle. In addition, the natural environment also purifies water through mechanical means (such as natural filtration as water moves through the soil profile) and biological means (such as the removal of water contaminants by vegetation or other aquatic life).

[506] Wright and Nebel, *Environmental Science* 8th Edition (New Jersey, 2002), p. 220.

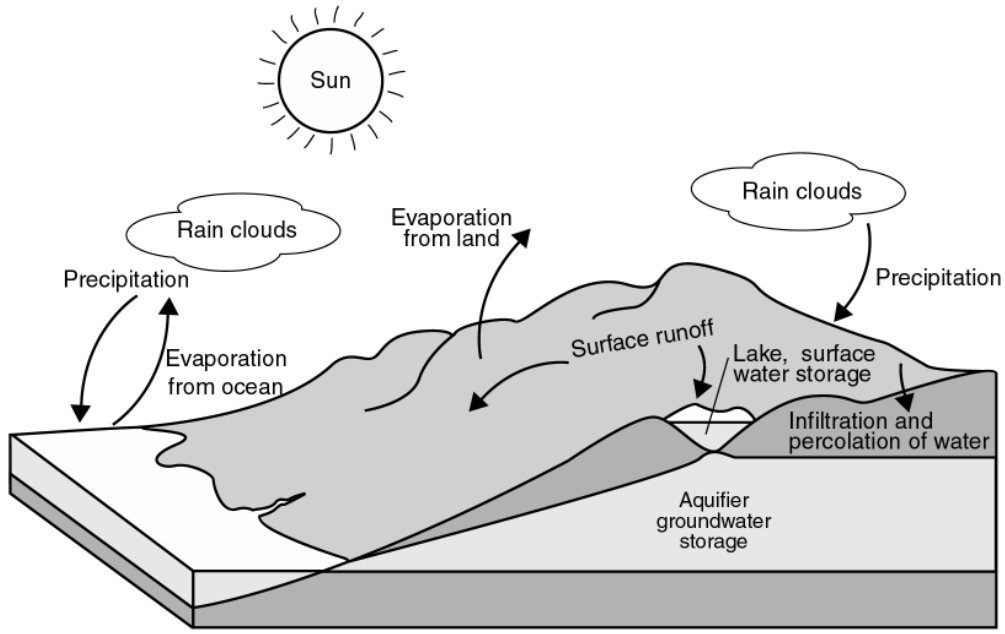

Figure 6.1 – the Hydrological Cycle

The hydrological system, which produces pure water for man, is a major component of the natural environment. The entire system – including water bodies (such as rivers, lakes and aquifers) as well as drainage basins and aquifer recharge areas – can be considered a 'fruit-producing tree' that provides *MQU* (in the form of HQFW) for man. Energy from the sun, as well as gravity, drive the processes of the hydrological system. These processes include purification of the water, and the climatic system that produces the rainfall in the needed locations, as well as the drainage and storage system which collect and store the HQFW until it is needed and accessed by man, and the systems by which the degraded water is collected and purified (biologically and/or mechanically) and returned to the system as HQFW. Since the hydrological system is classified in the model as *MPC*, the principle of *bal tashchit* provides it with a high level of protection (see chapter three, section 3.5). No part of the system may be degraded by man without ensuring that there is greater benefit to be gained. This includes activities which harm groundwater storage such as the overdrawing of aquifers (as will be discussed in section 6.2.4 below). In assessing the costs and benefits of any actions affecting the hydrological system, there would probably be no discounting of future benefits from the system (see chapter five, section 5.2.3.6).

Man-made purification

Man purifies water through mechanical means, such as filtration and distillation. To an increasing degree, man is also utilizing biological processes, such as the creation of artificial wetlands, to partially purify water. Biological processes tend to be slower but are able to utilize 'natural' energy rather than being dependent on human-produced energy. Therefore, they are usually less expensive and usually have less negative environmental impact.

One example of the mechanical restoration of *MQU* is the desalination of brackish or salt water to produce HQFW. Desalination facilities operate according to distillation, or more commonly, reverse osmosis, where the water is forced through semi-permeable membranes which permit the passage of water molecules but not larger contaminants. Both processes are extremely energy-

intensive, although reverse osmosis is considered more energy-efficient[507], and therefore the most commonly used method.

Man-made purification can also be seen as *MPC* for producing HQFW. It is important to note, however, that desalination can have a significant negative impact on other important environmental systems (*MPC*). This is particularly dependent on the source of the energy used. If fossil fuel energy is used to desalinate water, as is usually the case today, then the negative impacts caused by the extraction, transportation, refinement and combustion of the fuel (including air pollution, and contributions to climate change) need to be taken into consideration. In addition there can be other negative effects to the marine environment ranging from local destruction and disruption of marine life near the water intake pipes to harm from the discharge of waste brines, which have a high salt concentration, and can contain other harmful chemicals as well as waste heat[508]. The benefits of the HQFW produced must be weighed against the costs of these negative impacts to the ecological systems affected.

[507] Robert F. Service, "Desalination Freshens Up", *Science*, vol.313 (25 August 2006), p.1088.
[508] Raphael Semiat, "Desalination: Present and Future", *Water International*, vol.25, no.1 (March 2000), p.60.

6.2.4 Application of the principle of *bal tashchit* to the management of HQFW

As an approach to resource management, the principle of *bal tashchit* focuses primarily on the management of the *MQU* – in this case the purity – incorporated in water. Specifically, I will focus on the management of high quality fresh water (HQFW) which represents the highest *MQU*-carrying and therefore, highest benefit-producing and most important segment of the worlds water resources.

The choice of location - Israel

Resource management problems often occur in rapidly developing regions with growing populations and a rising standard of living. The demand for *MQU* in such situations frequently exceeds what can be sustainably produced by the local environment, and the production of negative *MQU* often exceeds the capacity of the local environment to sustainably assimilate and process the wastes. The State of Israel, in its brief history, exemplifies this situation and suffers from associated environmental problems such as the pollution of air, water, and land resources. Israel also suffers from a relative deficiency in many important natural resources, especially HQFW and (conventional) energy sources. In the words of David Ben-Gurion, Israel's first prime minister[509]: *Water and power, these are the two main things lacking in our country… The groundwaters, springs, rivers, and brooks of our country are limited and scanty. Even these have not been fully exploited; the water of the Jordan flows down to the Dead Sea, and the Yarkon water falls into the Mediterranean; a considerable proportion of the water of Lake Kinneret evaporates, and even the rains, plentiful in the north and minimal in the south, flow, wasted, in large measures to the Mediterranean or the Dead Sea, without fully benefiting the thirsty soil.*

While experiencing shortages and/or degradation of many important natural resources, Israel has a wealth of human resources – a relatively high population density[510] and a highly educated populace. A relatively large proportion of the Israeli population is involved in the 'knowledge' industries (such as education, and research and development). According to the model, these human resources and the *NQU* they produce should be able to at least potentially compensate for the lack of material resources and enable Israel to use its limited material resources (in our case, HQFW) more effectively and efficiently.

[509] David Ben-Gurion, *Southbound*, Tel Aviv Achdut Press, 1956, p. 305; as quoted in: Alon Tal, *Pollution in a Promised Land*, (Berkeley, 2002), p.200.

[510] Israel has a population density of 304 (people/km^2). This can be contrasted with the population densities of the Netherlands (392), Japan (339), the U.K. (246), and the U.S. (31). (Figures from July, 2005, according to: http://en.wikipedia.org/wiki/List_of_countries_by_population_density). Because of a relatively high rate of population growth, it can be expected that Israel's population density will exceed even the Netherlands in the near future.

Description of the current situation of HQFW in the land of Israel

Introduction: Israel's current sustainable supply of fresh water (of HQFW or near HQFW quality) is approximately 1.6 km^3/yr or 1600 MCM[511] (million cubic meters per year)[512]. Most of this water is stored in three natural reservoirs: Lake Kinneret (also known as the Sea of Galilee), the coastal aquifer, and the mountain aquifer. In addition to these three storage areas, relatively small aquifers are located in the Western Galilee, Eastern Galilee, Golan Heights, Jordan Rift and Arava Valley[513].

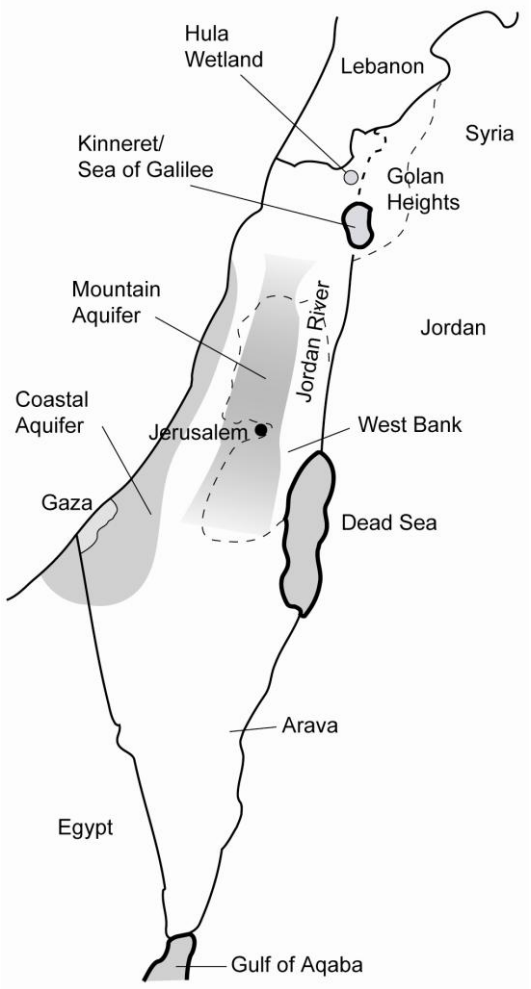

Figure 6.2 - Location of natural storage areas for HQFW in Israel.

[511] While *km^3/yr* (million cubic kilometers per year) is the internationally used measurement, *MCM* (million cubic meters per year) is a far more practical unit for smaller water measurements and is used extensively in Israel; therefore, I will use MCM in this study.

[512] Hillel Shuval, *The Role of "Virtual Water" in the Water Resources Management of the Arid Middle East*, from the 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at http://www.ipcri.org/files/water/water-papers.html. There is some disagreement as to the renewable water supply for Israel, with a range of estimates from 1550 MCM (Yoav Kislev, *The Water Economy of Israel*, Hebrew University, (Rehovot, Israel, 2001) at: http://departments.agri.huji.ac.il/economics/yoav-survey.pdf#search=%221550%20MCM%20%22) to 1900 MCM (Uri Shamir, Symposia Proceedings, Water for a Dry Land, Australian Academy of Technical Sciences and Engineering, 2003 at: http://www.atse.org.au/index.php?sectionid=637. It is important to note that in the early years of the State, Israeli water experts thought the renewable water supply could be as high as 3500 MCM (Alon Tal, 2002, p.202).

[513] Shoshana Gabbay, *The Environment in Israel*, State of Israel Ministry of the Environment, 2002; p.73.

Water resource development as well as water consumption have grown rapidly since the establishment of the State of Israel in 1948. According to Israel's Ministry of the Environment, all feasible [natural] water resources are now being exploited to their full capacity[514]. In drought years, these resources are being overexploited. The main concern with the overexploitation of Israel's HQFW is the long-term effects this may have on the viability of these reservoirs, which are an integral part of the MPC for HQFW in Israel. Over-exploitation is threatening their long-term viability by dangerously lowering the water levels and increasing the threat of degradation from salination and other forms of pollution.

A study published in 2002 by the Parliamentary Committee of Inquiry on the Israeli Water Sector declared[515]: *for over 30 years the Israeli water sector has been in a deep and continuous crisis, that recently reached a critical point. The crisis has manifested itself in the depletion of the water resources, causing a cumulative deficit of around 2 billion Cu.M [2000 MCM] in the country's natural water reservoirs.*

Natural sources of HQFW in Israel

Precipitation (mostly rainfall) is the natural source of replenishment fors HQFW. The total amount of precipitation that Israel receives in an average year is an astounding 10,000 MCM[516]. The vast majority of this HQFW – approximately 80 percent – is lost to evaporation or runoff into areas (such as the Mediterranean Sea or the Dead Sea) where it can no longer be utilized as HQFW. Israel's precipitation is highly variable, both in terms of location and consistency from year to year. Precipitation averages as high as 950 millimeters per year in some parts of the Galilee in the north to as low as 25 millimeters per year in the southern Negev[517]. Years of drought are interspersed with years of heavy rainfall. Seventy five percent of Israel's total precipitation is received during the four winter months, from December through March, when evaporation is lowest.

Increasing the supply of HQFW in Israel

Three principle ways of increasing the supply of HQFW in Israel are purification of lower quality water, capturing some of the precipitation water currently being lost to runoff, and the importation of HQFW from other countries.

Purification – HQFW can be produced by purifying water of lower quality, for instance from underground brackish water sources or from the Mediterranean or Red Sea. Israel has an almost unlimited supply of salt and brackish water which can be potentially purified into HQFW. However, purifying water is expensive, energy intensive and creates its own environmental problems, such as disposal of the waste brines (waste water with a very high salt concentration) and pollution from the production of energy required to power the purifying system. In order to increase the supply of HQFW, Israel has recently built and commissioned two seawater desalination plants in Ashkelon (2005) and Palmachim (2007), along its coast, with a potential capacity to produce 130 MCM of HQFW. Israel is also completing another plant in Ashdod with the capacity to produce 45 MCM of HQFW, and one in Hadera with a capacity for 50 MCM. By the year 2010, the Israeli government plans to produce over 350 MCM of HQFW from the

[514]Ibid, p. 74.
[515] Taken from the *Report by the Parliamentary Committee of Inquiry on the Israeli Water Sector*, (Jerusalem, June 2002), p.11, available at: http://www.knesset.gov.il/allsite/mark02/h0213355.doc.
[516]Gabbay, (1998), p. 17.
[517] Gabbay, (2002), p. 73.

desalination of brackish and salt water[518]. Israel's longer range plans are to increase the planned capacity for desalination to 505 MCM by 2012, and 650 MCM by 2020[519].

Capturing Runoff – Some of the water lost to runoff can be captured and stored in reservoirs. Most of this is storm runoff during and after winter rains. There appears to be a wide discrepancy between estimates of how much of this water can be captured. Gabbay writes[520]: *Surface runoff in most watersheds in Israel occurs for only a few days a year, after heavy rains. Numerous schemes have been set up for the collection of floodwater, some used from artificial recharge of groundwater and others as surface water impounding reservoirs…the mean annual yield of this water is estimated at 70 MCM.* According to the Israel Ministry of National Infrastructures[521]: *[There is the potential for] 135 MCM/yr of intercepted storm water from rivers into surface reservoirs… Other small schemes include hundreds of small runoff interception projects amounting to about 130 MCM.* Adding these up would amount to a potential of about 265 MCM. Tal writes[522]: *Water supplies in Israel have been augmented by an aggressive program of collecting rainwater… Starting in the 1980's, a network of 178 reservoirs was established across the country's rain gradient, with most located in semiarid and hyperarid regions. The system currently collects 125 MCM, which constitutes 7 percent of the total water in Israel's system.*

Import - Another option for increasing the supply of HQFW in Israel is to import water from Turkey, or other countries with a surplus of HQFW. The water could be imported in converted oil tankers, or, in the longer term, through pipelines. The total cost of importing water is significantly higher than the current price of HQFW in Israel. Nevertheless, the government has expressed interest in pursuing this option as a stop-gap measure.

The consumption of fresh water (including HQFW) in Israel

Agriculture (which includes plant irrigation, crop production, fish farming and animal husbandry) is the heaviest user of fresh water in Israel, as in most of the world. Approximately 57 percent of Israel's total fresh water consumption, goes to agriculture[523]. The percentage of HQFW consumed by agriculture in relation to other sectors in the economy, is constantly declining. While in 1970 agriculture used over 80 percent of the HQFW, in 2000 it used less than 50 percent[524], and in 2007 it was down to 38 percent[525].

To reduce its consumption of fresh water, the agricultural sector has substituted approximately 615 MCM of marginal water (from saline wells, floodwaters and recycled wastewater) for higher quality fresh water that it might otherwise consume[526]. In addition, Israel imports nearly 90 percent of all of its grains, saving as much as 3,000 MCM in irrigation water that would have been

[518] Alon Tal, 'Seeking Sustainability : Israel's Evolving Water Management Strategy', *Science*, (2006), Vol. 313, p.1083.
[519] Yaakov Libshitz, "Summary of the Emergency Conference on the Situation of Water Sources", *Water and Irrigation*, vol. 498 (May, 2008), p.25.
[520] Gabbay (2000), p. 89.
[521] The Israel Ministry of National Infrastructures, *The Water sector*, available at: http://eng.mni.gov.il/english/units/Water/Non-convetionalWaterResroucesandConservation.shtml.
[522] Tal, (2006), p.1082.
[523] Libshitz, (2008), p.24.
[524] Parliamentary Committee Report (2002), p. 63.
[525] Libshitz (2008), p.24.
[526] Ibid.

required to grow the equivalent amount in Israel[527]. Israel produces nearly all of the fresh fruits and vegetables that it consumes, and exports some of its home-produced agricultural products (particularly oranges and tomatoes as well as flowers).

Municipal usage (households and institutions) currently accounts for approximately 52.9 percent, and industry accounts for approximately 8.3 percent of Israel's HQFW consumption[528].

Trends for the water consumption in Israel

The trends for water consumption in Israel (both recent past and expected future) are illustrated in the following tables[529]:

Year/sector	Agriculture	Domestic	Industry	Total
1986	1,125	423	104	1,652
1987	1,188	445	109	1,742
1988	1,250	500	109	1,860
1989	1,236	501	114	1,851
1990	1,162	481	106	1,749
1991	875	445	100	1,420
1992	955	490	106	1,551
1993	1,125	527	110	1,762
1994	1,144	556	114	1,813
1995	1,274	588	119	1,981
1996	1,284	662	124	2,071
1997	1,264	705	123	2,092
1998	1,365	768	129	2,262
1999	1,265	765	127	2,157
2000	1,113	794	125	2,032
2007	1,180	770	124	2,074

Table 6.2: The distribution of the total consumption of water (sweet, brackish and effluents) in Israel between the years 1986 and 2000[530], and in 2007[531](in MCM).

Table 6.2 shows the total consumption of water in Israel between the years 1986 – 2007. As the Table shows, the amount of water used by the domestic sector, almost all of it HQFW, has nearly doubled over this period. The amount of water used by industry increased by 20 percent, and the amount used by agriculture showed little overall change. Total water use increased by 23 percent.

In 2002, The Parliamentary Committee Report presented the following projections for the water demand in Israel for the coming decade:

[527] Saul Arlosoroff, *Water Demand management – A Strategy to deal with Water Scarcity*, from 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at http://www.ipcri.org/files/water/water-papers.html.
[528] Libshitz (2008), p.24.
[529] Note: I was unable to find any data *specifically* referring to what I am calling HQFW in Israel. As discussed in this chapter, almost all of domestic and industrial water consumption in Israel can be considered HQFW, while the percentage of agricultural water consumption of HQFW in Israel has been very significantly reduced.
[530] Taken from the Report by The Parliamentary Committee of Inquiry on the Israeli Water Sector, (Jerusalem, June 2002), p.31, available at: http://www.knesset.gov.il/allsite/mark02/h0213355.doc.
[531] The numbers in the last row (2007) were taken from Libshitz (2008), p.24.

Year/ Sector	**Agriculture**	**Urban**	**Industry**	**Nature and landscape**	**Total Israel (natural sweet and desalinated)**	**Total Israel (sweet. brackish and effluents)**
2002	582	700	99	25	1,406	1,834
2003	577	700	100	28	1,406	1,880
2004	544	763	102	31	1,440	1,952
2005	541	800	103	34	1,460	1,995
2006	538	815	105	38	1,480	2,023
2007	535	830	106	41	1,501	2,060
2008	533	845	108	44	1,523	2,097
2009	531	860	109	47	1,545	2,135
2010	530	875	110	50	1,568	2,173

Table 6.3 – Projected demand for fresh water in Israel for the years 2002 – 2010 (in MCM)[532]

As Table 6.3 shows, the largest expected increases in demand are in the urban sectors (25 percent expected increase) and water allotted for nature, which is expected to double. In fact, the amount allotted to nature, as well as the total amount (natural sweet and desalinated) are now expected to show a greater increase, which will be supplied by more extensive desalination, as is discussed elsewhere in this chapter.

In the following table I have compared the projected numbers for 2007 (from the 2002 report) with reported numbers for the same year (from Libshitz, 2008).

Year/ Sector	**Agriculture**	**Urban**	**Industry**	**Nature and landscape**	**Total Israel (natural sweet and desalinated)**	**Total Israel (sweet. brackish and effluents)**
2007 (projected)	535	830	106	41	1,501	2,060
2007 (actual)	565	770	124	?	1455	2,074

Table 6.4 – Comparison of projected demand[533] *for fresh water in Israel for the year 2007* with actual numbers[534] (in MCM)

As this comparison shows, both agriculture and industry consumed more than projected, and urban consumption was lower than projected. It is unclear how much was actually alloted to nature and landscape. It is important to note that during the past four years (2005-2008) Israel received lower

532 Parliamentary Committee Report, p.31.
533 Ibid.
534 Libshitz (2008), p.24

than average precipitation. This has contributed to a nationally declared water crisis, in which all of the major water storage areas are below the 'red line[535]', by a cumulative deficit estimated at 300 MCM below these established minimum levels[536].

Other causes for the loss of HQFW in Israel

In addition to the above users, a large amount of potentially available HQFW is lost due to the following reasons:

Water Pollution (including salination) – Virtually all of Israel's reservoirs for storing HQFW are threatened by pollution, which lowers the quality of the water, resulting in a loss of *MQU.* Sources of water pollution include agricultural run-off, which contains fertilizers and pesticides, industrial wastes, which include hazardous chemicals, and municipal sewage, which can contain disease organisms as well as organic pollutants and hazardous materials. The overdrawing of HQFW – for example, withdrawing more water from Lake Kinneret than is being replaced, which has been common during drought years – increases the infiltration of salt water into these water bodies. In the long term, this increasing infiltration of salt water may render many of the already limited reservoirs of HQFW unusable. Salination and other forms of pollution have already rendered parts of the coastal aquifer unusable for supplying HQFW[537].

Water runoff and reduced infiltration – Increasing portions of the land overlying the coastal aquifer, and other recharge areas for the collection and storage of HQFW in Israel, have been covered over by buildings, roads, and other paved areas. Some of the precipitation falling on these covered areas is hindered from reaching the reservoirs, or is polluted along the way before it can reach them. For example, Frumkin writes[538]: *… accelerated building on the coastal plain aquifer's filtration areas decreases the available filtration surface area of one of the major aquifers and increases the leakage of contaminants into the aquifer.*

Water leakage and inefficient plumbing - A significant amount of HQFW potentially available to man is lost through leakage from reservoirs, conduits and plumbing fixtures before it reaches the user. Hawken *et al* write: *Even good urban distribution systems lose a tenth of their water; the average U.S. city, about a quarter, Bombay, one-third; Manila, over half*[539]. Water leaks in the Israeli municipal sector are estimated at approximately 12.2 percent[540].

It is important to realize that water consumption does not necessarily eliminate water from the water cycle. In the words of Lomborg[541]: *Looking at global water consumption,… it is important to distinguish between water withdrawal and water use. Water withdrawal is the amount of water physically removed, but this concept is less useful in a discussion of limits on the total amount of water, since much of the withdrawn water is later returned to the water cycle. In the EU and the U.S., about 46 percent of the withdrawn water is used merely as cooling water for power generation and is immediately released for further use downstream. Likewise, most industrial uses return 80-90 percent of the water, and even in irrigation 30-70 percent of the water runs back into*

[535] The 'red line' is an estimate of the lowest sustainable water level for water storage areas in Israel.
[536] Libshitz (2008), p.22.
[537] Parliamentary Committee Report, pp.136-137.
[538] Tamar Achiron-Frumkin and Ron Frumkin, *Water Allocation for Nature and the 'End of the Conflict' Era*, from the 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at http://www.ipcri.org/files/water/water-papers.html.
[539] Paul Hawken, Amory Lovins and L. Hunter Lovins, *Natural Capitalism*, (New York, 1999), p. 223
[540] Gabbay, (2002), p. 90.
[541] Bjørn Lomborg, *The Skeptical Environmentalist*, (Cambridge, 2001), p. 150.

lakes and rivers or percolates into aquifers, whence it can be reused. What Lomborg fails to mention, however, is that the withdrawn water is usually returned to the water cycle at a lower level of *MQU*, and often it carries negative *MQU* (such as chemical, biological or thermal pollution) when returned to the water cycle.

Reducing the demand for HQFW

The demand for *HQFW* can be decreased by conservation and/or substitution of lower quality water for HQFW. The greatest potential for conservation and substitution has been in the agricultural sector, which uses most of Israel's water and which is increasingly utilizing water of lower quality. Further effort is being made to maximize the amount of water substitution in the agricultural sector. For example, Gabbay writes that of the 440 MCM of municipal wastewater produced annually in Israel, approximately 350 MCM receives partial purification and of this, 285 MCM or 65% is reclaimed for reuse[542]. More recently, Tal writes that[543] (as of 2006) 91 percent of all municipal sewage in Israel is treated, 73 percent of which is recycled. Other lower quality water, such as brackish ground water is also being increasingly utilized for agriculture, particularly in the arid south, adding up to a total of approximately 615 MCM of lower quality water that is being utilized by the agricultural sector. It should be noted, however, that the increasing emphasis on recycling waste water is not a panacea. Recycled waste water (which is only partially treated and may still contain harmful materials and/or microorganisms) should not be used for growing food crops where the irrigation water can come in contact with the edible part of the plant (an exception is most tree fruits which are further removed from the irrigation water and which may be irrigated with recycled waste water). Also, even after treatment, recycled waste water has a relatively high concentration of salts. Continuous irrigation with recycled waste water or with brackish water can lead to a build up of harmful salts in the soil and lower productivity. Frumkin and Frumkin write[544]: *this practice* [of using recycled waste water for agriculture] *involves problems related with salination of soils and a possible gradual degradation of both soils and aquifers, a process that is also likely to affect natural systems as well.*

In addition to conservation in the agricultural sector, there are many ways for the municipal sector to conserve water, including using water saving devices on faucets, shower heads and toilets, checking for and fixing leaking plumbing, and reducing the use of HQFW for landscaping and gardening by using lower quality water and by using plants with lower water requirements. Approximately 180 MCM are used each year in Israel for gardening. By means of correct watering and compliance with the regulations, it is estimated that 50-60 MCM/year can be saved each year[545].

Israel has achieved success in the past in further increasing water conservation in the domestic sector, but this success has been difficult to sustain. For example, according to the Parliamentary Committee Report[546], *in the period of the 1990/1991 water crisis, there was a campaign for saving water in the municipal sector that was considered a success. The campaign managed to cut consumption by around 100 MCM for non-agricultural uses – especially in households. However,*

[542] Gabbay, (2002), p. 92.
[543] Tal, (2006), p.1082.
[544] Tamar Achiron-Frumkin and Ron Frumkin, *Water Allocation for Nature and the 'End of the Conflict' Era*, from the 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at http://www.ipcri.org/files/water/water-papers.html.
[545] Parliamentary Committee Report, p.105.
[546] Ibid, p.100.

the results of the campaign vanished following the heavy rainfalls of 1991/92. The exact amount that can be conserved in the domestic sector is a matter of debate, ranging up to 200 MCM/year according to some experts[547].

Conservation can also be considered a form of increasing the water supply, which compares favorably with alternative means of increasing production mentioned above. For example, to increase the water supply by desalination or importation of water brings along with it the requirement to build additional infrastructure for the added water which is not required with conservation. According to Yona Kahane[548]: *Saving in itself is a source of cheap, available and immediate water. But when you speak of desalination compared to saving, desalination drags behind it a train of additional expenses. This involves extending pipelines, whether conveyance lines, belonging to "Mekorot"[the national water carrier] or others, or urban lines... In addition, the sewage system, and the sewage treatment system will have to grow.*

Socio-economic perspectives on the shortage of HQFW in Israel

A sufficient supply of HQFW is of crucial importance for any society. The rapid increase in Israel's population in combination with the increasing level of per capita consumption places increased stress on the supply of HQFW. Nevertheless, Israeli citizens are amongst the most water-frugal in the developed world, and over the past decade, Israel's per capita water consumption in the municipal sector has slightly decreased[549]. The per capita consumption of water in Israel in 2006 (excluding agriculture and industry) was estimated at 104 cubic meters/year[550].

Gabbay writes[551]: *Economists have argued that the current water crisis is largely the result of unrealistic water prices to the agricultural sector – traditionally the largest consumer of water in Israel. Others have contended that price is not the only issue, that diminished water supply to agriculture would carry a severe social and economic price: destruction of rural agriculture, risk to independent food supply and disappearance of open space [because open agricultural areas are under threat of suburban development]*. The economists claim that if water were valued at a more realistic price then economic forces would ensure a sufficient supply; both by increasing the supply (through making desalination and import more economically feasible) and by encouraging more efficient usage of the water, thereby lowering demand[552].

Agricultural water subsidies reduced production costs, and enabled Israel's agricultural sector to expand and compete on international markets. As a result of the subsidies, the price of many of Israel's agricultural products do not reflect the true production costs. Exporting agricultural

[547] Ibid, p. 102.
[548] Parliamentary Committee Report, p.97.
[549] Shlomit Be'eri, Naomi Carmon, Uri Shamir, *Water Saving in Israel's Urban Sector: A feasibility Study* (2004), available at: http://www.wdm2004.org/new_web/technical_session/files/shlomit_beeri_carmon_and_shamir.pdf.
[550] Libshitz (2008), p.24.
[551] Gabbay, (2002), p. 91.
[552] For example, see: Fisher, F. M., S. Arlosoroff, Z. Eckstein, M. Haddadin, S. G. Hamati, A. Huber-Lee, A. Jarrar, A. Jayyousi, U. Shamir, and H. Wesseling, 'Optimal water management and conflict resolution: The Middle East Water Project', *Water Resour. Res.*, 38(11), (2002), p.1243.

products, which require a great deal of water to produce, is in effect, exporting valuable water – often to places such as northern Europe which are not lacking in HQFW[553].

Distortions in the economic system in Israel also bear some or the responsibility for encouraging pollution of storage areas for HQFW. For decades, industry, agriculture, and municipalities used Israel's rivers and some of the groundwater recharge areas as dumping ground for their wastes. Since the external costs of this waste disposal was not internalized, in other words, since the costs of the pollution of Israel's water system were not borne by those doing the polluting, polluters received significant economic benefit and had no economic incentive to cease this destructive activity.

To address the shortage of HQFW, Israel has allowed water prices to increase to closer to their true value. Israel has also made substantial investment in infrastructure such as desalinating facilities, water treatment plants, waste treatment facilities, water conserving equipment, improved environmental regulations and increased enforcement of these regulations. All of this has increased the costs of HQFW to the industrial, agricultural and municipal sectors. The increased costs are passed on to the public in the form of higher prices (for water and for goods and services that require large quantities of HQFW) and increased taxation. Poorer families, in particular, have been stressed by higher water prices, especially due to the multiplier effect this has on the price of many other needed goods and services. Whereas higher water prices to the agricultural sector have helped to conserve HQFW, in the municipal sector, the demand for HQFW has been found to be highly inelastic, and thus not responsive to price regulation[554].

Political ramifications of the shortage of HQFW in Israel

Another important factor, which this thesis does not cover in depth, is the political side of the water situation in Israel. The recharge and storage areas for much of Israel's supply of HQFW are located either in (currently) unfriendly countries (such as Lebanon) or in the disputed territories (the West Bank and the Golan Heights). In addition, there is a political dispute as to the distribution of the supply of HQFW between the Jewish and the Arab sectors.

Political factors play a role in the recent Israeli government decisions to build a number of seawater desalination plants on the Mediterranean coast, as described above. The Israeli government is negotiating future peace deals with the Palestinian Arabs on the West Bank (where most of the Mountain aquifer is located) and with Syria on the Golan Heights (which includes important water sources, and which may also include giving Syria access to Lake Kinneret). Each of these prospects could significantly reduce Israel's supply of natural HQFW. The only way to make up for these vast potential losses is through seawater desalination.

In general, the more acute the shortage of HQFW in the region, the greater the potential for political tensions. On the other hand, reducing the shortage to the point that there is sufficient HQFW for everyone could do much to help ease the tensions.

[553] Because the production of most agricultural products requires a great deal of water, the exportation and importation of agricultural products may be viewed as the redistribution of water resources. The concept of 'virtual water', described at the end of section 6.2.6, is meant to address this phenomenon.
[554] Tal, (2006), p.1084.

Administration of water resources in Israel

The administration of water resources in Israel is based largely on the Water Law which was passed in 1959, and is the only Israeli law that outlines the basic principles regarding the administration of the water sector in Israel. Article 1 of the Water Law, which embodies the essence of the Law as well as the basic assumptions at its basis, states that the water resources in Israel belong to the public, are governed by the State, and are designated to fulfill the needs of its inhabitants, and to develop the country[555].

Tal writes[556]: *The [Water] Law does not prescribe priorities in water allocations though such can be found in the Water Regulations (Water use in a Rationing Area), 5736-1976 which prescribe that in Rationing Areas, i.e. geographic areas in which the demand exceeds the supply, water allocations will be granted in the following order of priorities: (a) Domestic Uses; (b) Industrial Uses; (c) Agricultural Uses;(d) Other Uses. Since most of the country has been declared as a Rationing Area the above order of priority is in fact the general order of priority for all water allocations in Israel.*

It is interesting to note that these priorities appear to be similar to the hierarchy for resource use described in the fifth chapter of this thesis. The first four categories of the hierarchy (protecting human life, health, dignity, and 'religious duties') can be classified as 'domestic' uses (although the Water Regulations do not attempt to prioritize these like the hierarchy does), and both industrial and agricultural uses (as well as "other uses") would seem to fit into the sixth category. The main difference is the exclusion of category five (maintaining ecosystem services) in the Water Regulations.

An additional principle that is interwoven all along the water laws in Israel, is its treatment as a precious good, which must be preserved. For this purpose there is a whole chapter in the Water Law that deals with: "Protecting the Water". The instructions of the Water Law oblige every single person to treat the water that reaches him efficiently and with frugality, and to maintain the water installations in his possession in good order, so as to avoid waste of water. Tal adds that, as in most other environmental laws in Israel, the main problem is in the enforcement of the law rather than in the law itself[557].

[555] Parliamentary Committee Report, p.35.
[556] Alon Tal, *New Trends in Israel's Water Legislation and Implications for Cooperative Transboundary Management*, (2004) available at: http://www.ipcri.org/watconf/papers/alon.pdf.
[557] Ibid.

6.2.5 Application of goals and objectives for resource management to the management of HQFW in Israel

Chapter 5 introduced goals and objectives for resource management according to the principles of *bal tashchit*. My first step in applying the principle of *bal tashchit* is to apply these goals and objectives to the case of management of HQFW in Israel.

Goals – To make the best possible use of all potential *QU* (in this case, water purity – expressed as available HQFW) in order to satisfy the needs and wants of the populace. To prevent the unnecessary degradation of water purity. Where necessary, to increase amount of HQFW in the most efficient way.

Objectives

1. *Maximize Productive capacity for QU (maximize both NPC and MPC)*

    A. *Maximize producers of NQU – people who can contribute to the production of NQU for improving the management of HQFW. Invest in education as well as research and development relevant to the production and management of water purity.*

Israel is already considered a world leader in water-use efficiency. Over its short history, Israel has developed important water-conserving technologies such as drip irrigation[558], and increased its efficiency of water use. Saul Arlosoroff writes[559]: *Israel was established in 1948, a semi arid country, having a population of 650000, a GDP of $300/capita and was using approximately 300 cubic meters of water per person for all uses. In 2003, Israel has reached a population of 6.8 million personas, a GDP of $15,000/capita, and maintained the approximate parameter of 300 fresh cubic meters of water per capita, despite the large increase in personal and general income.*

Given the high level of education and innovation in the Israeli population, greater investment in appropriate areas of education, and research and development should lead to further increases in the production of *NQU* for water-use efficiency, and for the efficient production and protection of water purity. Much of this increased knowledge would also be transferable to other countries in arid zones and – on a worldwide basis – could potentially benefit billions of people experiencing shortages of HQFW. Suggested areas of research include:

- Increasing the capture and utilization of precipitation
- Increasing the water-use efficiency of household plumbing (showers, toilets, sinks, etc.)
- Development of more efficient systems for water reuse and recycling (including grey-water systems – see below)
- Increasing the efficiency of water purification

[558] Drip irrigation, developed by Simcha Blass in the 1960's, uses perforated pipes with applicators to apply water directly to the soil near the root zone of plants. Using drip irrigation, irrigation efficiency of 95 percent is possible, whereas the alternatives – sprinkler irrigation (up to 80-90 percent efficiency) and flooding (up to 60-80 percent efficient) waste far more water (see Sandra Postel, 'Redesigning Irrigated Agriculture', *State of the World 2000*, by The Worldwatch Institute, W.W. Norton & Co, 2000, p.51).

[559] Saul Arlosoroff, *Water Demand management – A Strategy to deal with Water Scarcity*, from 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at http://www.ipcri.org/files/water/water-papers.html.

- Development of clean, renewable, affordable energy sources (since energy plays a key role in water purification). Emphasize the development of solar energy. Israel has tremendous potential for solar energy because of high inflow of high intensity solar radiation – especially at the times of the most water-stress – in the summer when it doesn't rain. There is also a great deal of open space in the Negev, in the south of Israel, where the solar radiation is greatest and the water stress the highest. With abundant, affordable, clean energy, it becomes feasible to purify water into HQFW wherever needed.

B. *Maximize producers of MQU (water purity – expressed as HQFW). Maximize the capture and storage of precipitation, while retaining the purity of the water. Ensure that the most productive areas for the capture and storage of HQFW are well protected. If necessary, increase the biological and mechanical purification of water.*

Less than 20 percent of the 10,000 MCM of precipitation (HQFW) that Israel receives is currently utilized, with the remainder being lost to evaporation and runoff. Even capturing a small percentage of the lost HQFW could make a significant difference in the water situation, and could render some of the alternative means of increasing HQFW (such as desalination or importation) unnecessary. For example, capturing another 4 percent of the precipitation could yield up to another 320 MCM of HQFW to Israel's water supply – exceeding the amount expected to be added by desalination and importation in the near future. Based on past experience, capturing a greater portion of the precipitation Israel receives is certainly possible. In ancient Israel, cisterns were used extensively to collect and store rain runoff from roofs and courtyards, as well as in agricultural fields and valleys. Most Israelite households had their own cistern[560]. Using similar techniques today, enhanced with the benefits of modern technology, could help capture significantly more of the precipitation that Israel used to exploit, but currently loses.

Mechanical purification of HQFW is energy-intensive and depends on the availability of sufficient and affordable energy supplies. Therefore, the development of appropriate energy sources (especially clean and renewable sources such as solar) is an important objective in ensuring sufficient production of HQFW. Additionally, extensive desalination using energy derived from fossil fuels will likely further aggravate the climate change problem, which some believe will decrease the amount of precipitation in the area, and have a negative affect on the overall water situation[561].

2. Maximize efficiency of man's production and use of MQU:

A. Production of water purity – Where water is biologically or mechanically purified into HQFW, maximize the efficiency of the process. Develop more efficient processes for water purification.

B. Utilization of water purity – Maximize efficient use of HQFW. Use pure water only where the purity is needed. This will probably include the separation of Israel's

[560] Philip J. King and Lawrence E. Stager, *Life in Biblical Israel*, (Louisville, KY, 2001), p. 126.
[561] A study published in 2000 by Guy Pe'er and Uriel Safriel predicts that by 2100, unchecked climate change will cause Israel to experience a 4 to 8 percent drop in precipitation along with a mean temperature increase of 1.6º-1.8ºC, and a 10 percent increase in evapotranspiration – all of which could significantly worsen Israel's water situation (see Guy Pe'er, Uriel N. Safriel, *Climate Change, Israel National Report, under The United Nations Framework Convention on Climate Change, Impact, Vulnerability and Adaptation*, (October 2000), available at: http://www.bgu.ac.il/BIDR/rio/Global91-editedfinal.html#_Toc495168284).

domestic and industrial fresh water supply into different grades of water so HQFW is not used for inappropriate purposes, as described below.

Within the current water supply situation, Israel does not have enough HQFW to sustainably meet all of its needs and wants. On the other hand, since HQFW is the only grade of water currently supplied to most households, industry and other institutions (excluding agriculture), HQFW is used for purposes, such as flushing toilets and watering gardens, that do not require such a high level of purity[562]. By separating Israel's domestic and industrial fresh water supply into different grades of purity (as is already done for agriculture), HQFW can be used more efficiently – where it is needed – and water of lower purity can be used for other purposes. This will contribute to achieving the goal of preventing the unnecessary degradation of water purity. Israel's domestic and industrial water supply can be separated into the following three basic grades:

- *High quality fresh water (HQFW)* – water that meets drinking water standards for purity. This includes treated storage water (from Lake Kinneret), desalinated water and untreated water from aquifers and natural springs that meets the purity standards.

- *Recycled 'grey water*' (*GW*) – moderately pure water that doesn't meet drinking water standards, and shouldn't be used for drinking or food preparation. Grey water can include a treated mixture of waste water from bathing, dishwashing and laundry (not containing human wastes) with seasonally-collected storm runoff and surplus untreated water from storage reservoirs (Lake Kinneret and aquifers). This water should receive sufficient treatment to remove any harmful materials (such as pathogens) and can be used for activities such as washing floors, watering plants, and flushing toilets, where HQFW is not required.

- *Recycled waste water* (*WW*) – water from industrial and domestic effluent that receives treatment to remove most hazardous substances such as pathogens and heavy metals. WW has a negative *MQU* for most human uses, excluding irrigation of *non-food crops* where it can have a positive *MQU* because of the plant nutrients it carries such as nitrogen and phosphorous.

Separating water into different grades is not a new idea, but still faces a number of technological, social and economic hurdles before it can be implemented on a large scale. Israel has already developed a system for using recycled waste water (WW) for agriculture, although this is not connected to households, industry or institutions. What is needed is an additional separate system – serving households, industry and institutions – for the use of recycled grey water. There are a number of hurdles to overcome before such a system can be utilized. Friedler and Hadari write[563]: *Grey water, in contrast to common perception, may be quite polluted, and thus may pose health risks and negative aesthetics (i.e., offensive odour and colour) and environmental effects. As a result, highly efficient and reliable conveyance, storage and treatment systems are required.*

According to Friedler and Galil, up to 54 MCM water/yr could be saved by the year 2023 through the implementation of on-site grey water recycling in the Israeli domestic center, the amount produced by a medium-sized desalination plant[564].

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[562] Mekorot – Israel's national water supplier estimates that 40 percent of all household water use goes to flushing toilets (see www.mekorot.co.il/Mekorot/DidUKnow/DidUKnow.htm).

[563] E. Freidler and M. Hadari, "Economic feasibility of on-site greywater reuse in multi-storey buildings", *Desalination* 190 (2006), p.222.

[564] E. Friedler and N.I. Galil, "Domestic greywater characterization and its implication on treatment and reuse potential", *Advances in Water Supply Management*, eds. Butler and Memon (Lisse, 2003), p.544.

I am recommending a wider definition of 'grey water' which includes storm runoff and surplus untreated water from storage reservoirs (including lightly polluted portions of the aquifers that is not fitting for HQFW). Therefore, the potentially available quantities would be far greater than the 54 MCM estimate given above.

There are different alternatives for enabling the use of GW, all of which would require changes in plumbing and water use. Grey-water recycing is one of the recommended areas for further research and development mentioned above. Additional *NQU* is needed for making the use of grey water feasible on a large scale.

3. *Prioritize uses of MQU. First use MQU (HQFW) only for basic human necessities, where there are no better substitutes. Ensure there is enough HQFW – available to the entire population at an affordable price – to meet everyone's basic needs, such as drinking, food preparation, basic hygiene, health care, and laundry (Section 6.2.6 below will discuss this in detail).*

4. *Minimize throughput of MQU (HQFW) for non-essentials. Substitute NQU for MQU wherever possible.*

    A. *Economy – Promote a more information-based economy. Focus on producing know-how, innovation, and more efficient ways of doing things, rather than on types of industry and agriculture that require relatively high quantities of HQFW. Subsidize water-saving technologies (which can be seen as a manifestation of NQU) such as low-flow shower heads and low-irrigation landscaping. Minimize the use of HQFW for agriculture and industry.*

    B. *Education – Teach principles of sustainable water management to all citizens, with emphasis on conserving HQFW. Teach and emphasize the principle of bal tashchit* in the education system.

    C. *Entertainment and recreation – encourage low HQFW-requiring (and low fossil-fuel energy requiring) activities such as literature, hiking, and football rather than HQFW-intensive activities such as water parks and swimming pools. Where HQFW is used for entertainment and recreation, insist on supplying it at full price, and at limited quantities (which should encourage these facilities to use on-site water recycling systems).*

6.2.6 Prioritization of needs for HQFW

I can define *bal tashchit* – for our example – as the *prohibition against needlessly degrading the purity of HQFW*. Therefore, from the time that HQFW is received – either from natural precipitation, or through man-made purification – the purity of the water must be carefully managed to ensure that it is not needlessly degraded. This includes all the stages of the movement of HQFW, including the path to the storage areas (Lake Kinneret, or the aquifers), as well as the path through the water treatment and distribution systems until it reaches the consumer, as well as how the consumers use the HQFW. Since almost every use of *HQFW* will degrade its purity, the principle of *bal tashchit* requires ensuring that there is sufficient need for a high level of water purity before *HQFW* is used.

There are many conflicting needs for *HQFW* in a society with limited water resources such as Israel. The conflicting needs for HQFW are not equal in their importance. For example, *HQFW* is needed for drinking and food preparation to maintain human life and health. These uses are clearly of higher importance than the need for HQFW for washing floors or watering the garden. A key step towards applying the principles of *bal tashchit* to the management of *HQFW* in Israel is prioritizing the needs for HQFW.

Historical Background to prioritizing water-use

Prioritizing water uses has probably been done – at least on an informal basis – from the beginnings of human civilization. R. Carmell[565] describes a case of simple prioritization in the Talmud[566]:

> *If a spring serves as the water supply for two towns but is insufficient for the needs of both, then the town nearer the source takes precedence for all its needs – drinking water, animals, laundry, etc. so long as the needs [between the two towns] are equivalent. If it is a question of choosing between the farther town's drinking-water and the nearer town's laundry, then the farther town's drinking-water comes first. But, Rabbi Yose says: Even in this case the nearer town comes first; their laundry takes precedence even over the others' drinking water.*

The opinion of Rabbi Yose – that the nearer town's laundry takes precedence over the drinking water of those living downstream – is quite surprising, considering the importance the Torah places on human life and health. The Talmud explains Rabbi Yose's ruling as being based on the danger to the mental health of the residents in the closest town if they are forced to constantly wear dirty garments[567]. While the halacha (legal decision) in this case goes according to the first opinion, Rabbi Yose's ruling demonstrates the importance of dignity (which Carmell explains is affected by the appearance and condition of one's garments) to the wellbeing of man, as discussed above in chapter five (section 5.2.3).

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[565] R. Aryeh Carmell, 'Judaism and the quality of the environment', *Challenge – Torah views on science and its problems*, 2nd Edition, (Jerusalem, 1976), pp 507–508.

[566] B.T. Nedarim 80b. מעיין של בני העיר, חייהן וחיי אחרים - חייהן קודמין לחיי אחרים, בהמתם [ובהמת אחרים - בהמתם] קודמת לבהמת אחרים, כביסתן וכביסת אחרים - כביסתן קודמת לכביסת אחרים, חיי אחרים וכביסתן - חיי אחרים קודמין לכביסתן, רבי יוסי אומר: כביסתן קודמת לחיי אחרים. (תלמוד בבלי מסכת נדרים דף פ:).

[567] Ibid.

Fitting water-use in Israel into the resource-use hierarchy[568]

The overall goal in applying the hierarchy for resource uses to the water situation in Israel is to ensure that there will always be sufficient water of appropriate purity to meet the highest priority needs before supplying water to lower priority needs and wants. It is important to emphasize that in normal to wet years there may be an excess of HQFW whereas in drought years, where rainfall is insufficient, there may be a lack of HQFW. Therefore, it is important to allow enough flexibility to ensure that even in cases of drought, the highest priorities always have sufficient supply of the quality of water that they need.

The hierarchy is presented below along with representative uses of water for each category, the grade of water required, and an estimation of the amount needed (see Tables 6.2 – 6.5). Note that the highest two priorities (categories 1 and 2) have been combined because there is not likely to be any practical difference between them in relation to the allocation of HQFW.

Category 1 and 2 – Preserving Human Life and Health

The highest priority for the use of water purity is for the preservation of human life and health. In the words of water expert, Peter Gleick who authored a study entitled *Basic Water Requirements for Human Activities: Meeting Basic Needs*, which focuses on the water-scarce Middle East (primarily Israel and Jordan) [569]: *A first step toward sustainable water use would be to guarantee all humans the water needed to satisfy their basic needs*. HQFW is needed for drinking and food preparation as well as personal hygiene and health care, where water of a lower purity can not be substituted. Unless disposable utensils are used, HQFW also needs to be provided in sufficient quantities for dishwashing[570].

In addition, each individual must be provided with the means for a healthy diet. If the food is to be grown and/or processed in Israel, sufficient water must be provided for this – although water used for growing food need not be HQFW. If the food is imported, then there will be appreciably less need for water. On the other hand, this will potentially decrease Israel's food security and may have other adverse effects[571]. Using water for food production is a major issue in water management and will be discussed in more detail in section 6.2.6.

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[568] See chapter five, (section 5.3) for a detailed description of the resource-use hierarchy.

[569] Gleick, (1996), p. 90.

[570] The use of disposable eating utensils (plates, forks, knives and spoons) can help save HQFW that would otherwise be required for washing re-usable utensils, and is sometimes recommended in situations of severe water shortage (see for example the *Water Shortage Response Planning Handbook* by the North Carolina Department of Environment and Natural Resources, May 2003, available at: http://www.ncwater.org/Water_Supply_Planning/Water_Conservation/wsrhandbook.pdf#search=%22water%20shortage%2C%20use%20disposable%20utensils%22). This has to be balanced against the costs (including the waste management costs) of using disposable utensils.

[571] For example, this may have adverse effects on Israel's economy (although agriculture only accounts for about 2 percent of Israel's GDP according to the Parliamentary Committee Report (2002, pp. 69-69). In addition, the preservation of agriculture has helped preserve some of Israel's open spaces in light of increasing pressures to develop this land for other, more profitable but perhaps less environmentally-friendly uses. Importing food as a measure for reducing the water demand is discussed further at the end of section 6.2.6.

Use	**Grade of Water Required**	**Estimated Quantity Required (m^3/capita/yr)**[572]
Drinking and food preparation	HQFW	5.5
Basic Personal Hygiene	HQFW	5.5
Basic Health Care	HQFW	5
Sanitation (see Gleick on next page)	HQFW or GW	7.3
Agriculture (for growing food and fiber necessary for human life and health for local consumption) which requires irrigation (Note: this is primarily a security concern, depending on whether basic food supplies are grown in Israel (more secure) or imported from elsewhere where water is more abundant (less secure) – see end of this section for more discussion on this.)	*GW* (for food for direct human consumption, to avoid risk of pathogens and toxic substances, or *WW* for crops not directly consumed by humans.	According to the Food and Agriculture Organization (FAO) of the United Nations it takes 2000-5000 liters of water to produce enough food for one person per day[573]. This equates to a range of 730 to1825 m^3/capita/yr.
Estimated total for preserving human life and health	**Per Capita** 23.3 m^3 , of which 16 m^3 must be HQFW (and if totally food self-sufficient, an additional 730 m^3/capita/yr – using the lower range of the FAO figure above).	**For population of 7 million** 163 MCM, of which 112 MCM must be HQFW (plus up to an additional 5110 MCM for increased food self sufficiency).

Table 6.5 – Basic water requirements for preserving human life and health

Gleick writes[574]: *While the amount of water required to maintain survival depends on surrounding environmental conditions and personal physiological characteristics, the overall variability of [basic] needs is quite small.* Gleick estimates the minimum requirement for HQFW to facilitate human survival (drinking and food preparation) in a tropic to subtropic climate such as Israel's to be 15 liters per day or just under 5.5 cubic meters/person/year.

[572] Figures based on Gleick (1996) unless otherwise noted.
[573] Food and Agriculture Organization (FAO) of the United Nations, available at http://www.wbcsd.org/plugins/workspace/message.asp?.
[574] Gleick, (1996), p.84.

The second level of water needs is for basic personal hygiene (bathing, washing and cleaning of personal effects) – keeping the body, as well as eating and drinking utensils reasonably clean in order to maintain health and prevent infection. For this use, Gleick recommends an additional 15 liters/day or approximately 5.5 cubic meters/year. Gleick adds[575]: *There is a direct link between the provision of clean water, adequate sanitation services, and improved health… while no water is required for sanitation [removing human wastes], two factors argue against doing this [against not allowing the use of water for sanitation]: additional health benefits are identifiable where up to 20 liters per capita per day [approximately 7.3 m^3] of clean water are provided; and where economic factors are not a constraint, cultural and social preferences strongly lean towards water-based systems. Access to some water for sanitation, together with concurrent education about water use, decreases the incidence of diseases, increases the frequency of hygienic food preparation and washing, and reduces the consumption of contaminated food products. Accordingly, while effective disposal of human wastes can be accomplished with little or no water when necessary, a minimum of 20 liters per person per day is recommended here to account for the maximum benefits of combining waste disposal and related hygiene, and to permit for cultural and societal preferences. This level can be met with a wide range of technological choices.*

The additional 20 liters Gleick recommends for sanitation adds another 7.3 m^3/person/year (although this doesn't require the use of HQFW). I have also allotted 5 m^3/person/year of HQFW for basic health care, for the treatment of the sick or infirm. As figure 6.2 shows, I can estimate a total requirement of approximately 23.3 m^3/person/yr excluding agriculture. Only about 16 m^3 of this must be HQFW.

[575] Ibid, p.85.

Category 3 – Preserving Human Dignity

The preservation of human dignity calls for a higher level of water use – for cleanliness and physical appearance – than would be required for meeting the most basic needs in the first two categories. This includes the provision of sufficient water for additional bathing (beyond the minimum for basic needs) as well as laundry[576] and housecleaning. While additional bathing requires HQFW, it may be possible to use water of a lower quality for laundry and housecleaning, if needed – assuming that a suitable grey-water system is available.

Use	**Grade of Water Required**	**Estimated Quantity Required (m^3/capita/yr)**
Additional (non-essential) bathing	HQFW	5
Laundry	HQFW or GW	5
Housecleaning (washing floors and other household surfaces)	HQFW or GW	2
Estimated total HQFW required for preserving human dignity	**Per Capita** 12 m^3 (of which 5 m^3 must be from HQFW)	**For population of 7 million** 84 MCM (of which 35 MCM must be from HQFW).

Table 6.6 – Basic water requirements for preserving human dignity

Until here I have provided sufficient water to meet the most basic human needs. This amounts to the provision of approximately 35.3 m^3/capita/yr or 247 MCM of HQFW for the current level of population (7 million). With a satisfactory grey water system, the total amount of HQFW required is reduced to about 21 m^3/capita/yr, or approximately 147 MCM for the current population, with grey water supplying the additional 100 MCM.

[576] The importance of clean and proper clothing to the preservation and maintenance of human dignity is described in chapter five, at the end of section 5.2.3.3.

Category 4 – Observing Religious duties

The Jewish religiously-observant population requires sufficient water to meet ritual needs such as the periodic immersion in a ritual bath (mikveh[577]) and the ritual washing of hands (which is required upon waking up, before eating bread, after using the bathroom, etc.)[578]. The Muslim religiously-observant population also requires sufficient water for religious ablutions. In relative terms, the amounts required for these needs are minimal, and fulfilling these requirements would not be expected to impact the available supply of HQFW in Israel, even if the entire population was religiously-observant.

Use	**Grade of Water Required**	**Estimated Quantity Required (m^3/capita/yr)**
Mikveh (ritual bath)	HQFW	Very difficult to estimate. A mikveh must contain a minimum of approximately 1000 liters of water[579]. A number of people can use the mikveh before changing the water, since people generally bathe before entering the mikveh. In times of water shortage, the mikveh water can be changed less frequently.
Ritual washing of hands	HQFW	150 ml (one 'revi'it'[580]) of water each washing[581] multiplied by an estimated 10 washing/day = 1.5 liter/person/day which equals approximately 0.6 m^3/capita/yr
Ritual ablutions - washing of hands, feet and other body parts	HQFW	Estimated to be approximately same amount as above for ritual washing of hands (estimated need of double amount/ablution, but only 5 times/day).
Estimated total HQFW required for fulfilling religious duties	**Per Capita** 1 m^3	**For population of 7 million** 7 MCM

Table 6.7 – Basic water requirements for observing religious duties

As discussed in chapter five (section 5.2.3.4), educating the public on the conservation and proper use of resources (in our case HQFW) is included under religious duties. This requires the investment of *MQU* for education, and can be expected to increase the appropriate *NQU* (knowledge and 'righteousness' in proper water management) of the public. I would not expect this effort to require any investment in additional HQFW, and should, over time, produce a decrease in the overall consumption of HQFW. This educational effort can be viewed as substituting *NQU* (increased knowledge and 'righteousness') for *MQU* (HQFW), which is one of my stated objectives.

[577] The laws of immersion in a mikveh are presented in *Shulchan Aruch*, Yoreh Deah, sections 200-202.
[578] The laws concerning the ritual washing of hands are presented in the *Shulchan Aruch*, Orach Chaim 4:18.
[579] This is following the most stringent opinion. Others rule that a smaller amount of water is sufficient.
[580] This is the minimum amount of water required by the *Shulchan Aruch* (Orach Chaim 4:18) for ritual hand-washing.
[581] There is disagreement as to the volume of a 'revi'it', ranging from 86 – 150 ml. I have chosen the largest value of 150 ml for this study.

Also included in this category would be the investment of any HQFW and other forms of *MQU* (money, energy, etc.) required for increasing education and research and development (*NPC*, *NQU*) for water management. In fact, relative to monetary investment, Israel has been derelict in this area. According to the Parliamentary Committee Report[582]: *the national research budgets for topics connected with the water sector, have been declining. Most of the existing budgets come from abroad - especially from the European Union and individual European states such as Germany, whose orders of priority are different to those of the State of Israel, so that not all the studies that they finance, are relevant to the problems of Israel.*

Because of declining budgets, there was also a decline in the education and training of water experts. The Parliamentary Committee Report writes[583]: *One of the results of the absence of proper treatment by the State regarding the issue of allocating resources [money for water research], is that the cadre of professionals in the sphere of hydrology and water quality is diminishing, exactly at a time when there is an urgent need for them.* Only in recent years has Israel been reversing this trend.

[582] Parliamentary Committee Report, p. 150.
[583] Ibid, p.151.

Category 5 - Preserving and building the productive capacity of the natural environment

According to the hierarchy, the allotment of sufficient quantities of water of sufficient quality for the preservation of the productive capacity of the natural environment is mandated by the principle of *bal tashchit*. This is reflected in the ruling of Maimonides[584] who writes that one who *stops up a spring* (thereby diverting water from a fruit-producing tree) violates the prohibition of *bal tashchit*. According to my interpretation of this ruling, the removal of water needed for the proper functioning of the natural environment – unless the water is needed for a higher category in the hierarchy – is prohibited.

Preserving, the *MPC* of the natural environment is only recently beginning to receive the attention it deserves. Gleick writes[585]: *In traditional water planning and management, the water needs of the natural environment are rarely considered or guaranteed…Ultimately, society will have to make decisions about which ecosystems should be maintained or restored and the indicators by which to measure their health. Then, minimum allocations of environmental water will have to be made on a flexible basis, accounting for climatic variability, seasonal fluctuations, and other factors.*

Frumkin and Frumkin write[586]: *Regarded a scarce resource, water is mainly managed for human use, while water allocation for nature is primarily perceived as a luxury. The degradation of water sources affects natural ecosystems in their ability to maintain themselves and to provide humans with ecosystem services. Water shortage joins with habitat loss and defragmentation to make ecosystems less resistant to changes and catastrophes. The main loss of species and habitats in Israel in the last decades has occurred in wetlands.*

Looking at the history of water management in the State of Israel, it appears that the allocation of water for the natural environment has been almost completely neglected. For example, the portion of the Jordan River ecosystem stretching from Lake Kinneret to the Dead Sea was severely damaged by water withdrawals and drainage projects on both sides of the river (Israel and Jordan). Othofer writes[587]: *50 years ago the Lower Jordan River carried about 1,300 MCM/yr of quality freshwater to the Dead Sea. The river had sustained natural fauna and flora, and it had maintained equilibrium with adjacent aquifers. Presently, the river carries only saline and polluted water and wastewater, about 35 MCM/yr at its inflow … and about 100-200 MCM at its outflow to the Dead Sea.*

Another example is the Hula valley, once a lake and surrounding marshes, in northern Israel. The area was drained in the 1950's for a variety of reasons, including to help control malaria-carrying mosquitos that used the wetlands for breeding, and to reclaim the land for agriculture. This drainage nullified most of the ecological services provided by the wetlands such as the filtering and storage (in times of flooding) of water flowing into Lake Kinneret. It also caused the loss of native flora and fauna, exposed the organic soils to oxidation and resulted in land subsidence[588].

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[584] Maimonides, *Mishneh Torah*, ed. S. Frankel (Jerusalem and B'nei Braq, 1998), Laws of Kings 6:10, vol. 12, pp. 263-264. (see section 3.14).
[585] Gleick, (1996), pp. 86-87.
[586] Frumkin, (2004).
[587] Rudolf Othofer, Ra'ed Daoud, Jad Isaac, Hillel Shuval, *Options for a more Sustainable Water Management in the Lower Jordan Valley*, from the 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at http://www.ipcri.org/files/water/water-papers.html.
[588] For more information on the Hula wetlands, see *Water for the Future, The West Band and Gaza Strip, Israel, and Jordan*, Committee on Sustainable Water Supplies for the Middle East, National Academy Press, Washington D.C, 1999, pp. 82-86.

Because of these negative effects – especially the deterioration of the quality of water in Lake Kinneret – some parts of the Hula wetlands were restored in the 1990's[589].

Use	**Grade of Water Required**	**Estimated Quantity Required (m^3/capita/yr)**
Irrigating fruit producing trees	WW	Can use WW instead of HQFW
Ensuring that vital ecological systems (forests, wetlands, surface and ground water systems) have sufficient water of necessary quality to operate optimally in providing their services to man	HQFW, GW, WW	Very difficult to estimate. Frumkin and Frumkin write that the Israel Nature Reserves and Parks Authorities wish to leave an additional 150 MCM to nature and to conservation of open spaces and an additional 50 MCM for river restoration, totaling 200 MCM[590]. The additional quantities of water can be expected to increase the ecological services the natural areas can provide.
Estimated total HQFW required for preserving the productive capacity of the natural environment	**Per Capita** (for pop. of 7 million), range of 28.6 m^3 – 143 m^3	**For any population level** 200 MCM – 1000 MCM range, though none of this need be HQFW.

Table 6.8 – Basic water requirements for preserving the productive capacity of the natural environment

According to the Parliamentary Committee Report[591]: *Until recently, one always spoke about water for agriculture, water for urban needs and water for industry and services, but not about water for nature. It transpires that in normal times, nature consumes around 150 MCM, most of which eventually returns to the aquifers. However, as a result of the current water crisis, the water does not reach its destination by natural ways, and as a result, around 100 out of 160 wet habitats in Israel, have been destroyed…in the final version of the Master Plan [Israel Master plan for the Development of the Water Sector in the Years 2002-2010,* Final Report, April 2002], *there is mention of preparations for the allocation of 25 million Cu.M of sweet water per annum for nature requirements this year, and of 50 million Cu.M in 2010. The possibility was also mentioned of using high quality effluents, instead of sweet water.*

The situation in Israel is improving. Tal writes[592]: *While the Water Commissioner in practice [sometimes] allowed for considerable water to flow into nature reserves, streams and other "ecological" uses, such allocations until recently had no basis in law. Under section 6 of the Water Law, water could only be utilized for the following purposes:*

[589] Tal (2002), p.320.
[590] Frumkin (2004).
[591] Parliamentary Committee Report, pp.147-148.
[592] Alon Tal, *New Trends in Israel's Water Legislation and Implications for Cooperative Transboundary Management*, from the 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at: http://www.ipcri.org/watconf/papers/alon.pdf.

(1) domestic purposes;
(2) agriculture;
(3) industry;
(4) handicraft, commerce and services;
(5) public services.

While, some commentators attempted to call natural systems "public services" it was an extreme stretch of interpretation and there still was no clear Parliamentary directive to consider the needs of nature in allocating water resources. This changed during the spring session of 2004 of Israel's Knesset when Water Law Amendment #19 was enacted which added a sixth use for water: "protection of natural values and landscape, including springs, streams and aquatic-habitats. Moreover, the Water Commissioner is now required to submit an annual report to the Knesset on May first of each year documenting and justifying the extent of the country's water allocations to nature.

An important issue in the restoration of water the productive natural environment is the quality of water to be supplied. Frumkin and Frumkin write[593]: *It is generally agreed that water for aquatic organisms should be better than drinking quality standards.* On the other hand, the 'Committee on Sustainable Water Supplies to the Middle East' writes[594]: *Until 1991, the prevailing notion was that aquatic ecosystems should be rehabilitated by elimination of all effluents, ensuing flow of freshwater only. But the realities of water scarcity in the study area made it clear that rivers will dry up completely if the discharge of high-quality effluents back to them is not permitted when freshwater allocations are unavailable. For example, the Hula Nature Reserve in Israel has been found to function even when much of its water is effluent. The notion of using wastewater to help support biodiversity is based also on the belief that natural ecosystems can 'serve themselves' by processing the wastewater.* It seems likely that, given the water stress of the region, recycled waste water or grey water would provide a more practical and secure source of water supply for Israel's productive natural environment. The quality of the water released to nature will likely affect the type of organisms, with cleaner water favoring certain species and less pure water favoring others. Limited quantities of certain 'contaminants' such as organic matter can have a favorable influence on wildlife because of the nutrients they provide. Other contaminants, such as heavy metals and synthetic organic compounds can have a very deleterious effect on all desirable wildlife.

It is important to stress that the most important aspect of category 5 is to ensure the sufficient protection of Israel's natural water system. This includes the watersheds for surface water (areas where precipitation falls and drains into Lake Kinneret), and the aquifer recharge areas (areas where precipitation falls, drains and penetrates into groundwater reservoirs) which must be protected from pollution and overexploitation. As mentioned above in section 6.2.3, the entire water supply and purification system can be considered a 'fruit-producing tree' (*MPC*) that provides *MQU* (in the form of HQFW, as well as other important services) for man.

In one respect, desalination can be seen as an important aid to the natural water supply and purification system, since it can relieve pressure on the system by reducing or eliminating the need for overdrawing of the natural storage areas of HQFW. In addition, desalination produces very pure water which can be reintroduced to the natural storage areas (including Israel's small

[593] Frumkin (2004).
[594] Committee on Sustainable Water Supplies for the Middle East, *Water for the Future, The West Band and Gaza Strip, Israel, and Jordan*, National Academy Press, Washington D.C, 1999, p 91.

rivers and streams) to dilute encroaching salts or other pollution. Of course, this has to be weighed against the costs, including the environmental costs of desalination discussed in section 6.2.3.

Until now, I have focused on supplying fresh water to meet basic human needs and the needs of the natural systems upon which man depends for his life and well-being (categories 1 – 5). As discussed in chapter five (section 5.2.3.6), these needs are placed above economic considerations. The water supplied to meet the needs for categories 1 – 4 must be affordable to the entire population, regardless of their financial situation. The total requirement for a population of 7 million (excluding irrigated agriculture) ranges between 454 MCM to 1254 MCM, depending on how much water is allotted to category 5 – sustaining the productive natural environment. Of this amount, a minimum of 254 MCM must be HQFW. Adding an extensive grey water system could reduce the HQFW requirement to perhaps only 154 MCM, with the additional 300 to 1100 MCM being supplied by lower quality water including grey water. The remainder of the fresh water supply – which I am calling 'surplus' – can be allotted for meeting non-essential human needs and wants as follows in category 6 below.

It is important to note that I have not included industry under basic human needs (other than the health-care industry, which was partially addressed by the allotment of 5 m^3/person/yr for 'basic health care' in table 6.2 above). While industry plays an important role in the wellbeing of the population, I am not considering it a basic need that should be placed above other economic considerations.

Category 6 - Maximizing economic value

While economic considerations are not meant to be the primary factor in allotting HQFW for the above categories in the hierarchy (categories 1 - 5), any HQFW remaining after fulfilling all of the above needs should be utilized in the way that maximizes the economic value. To do this in the most economically efficient way, I recommend allowing the free market to allocate this water at real (unsubsidized) prices, according to supply and demand. In this way, prices can be expected to rise during shortages and limit (unnecessary) consumption, and in times of abundance, prices should decrease, allowing higher consumption (although wasteful consumption is always proscribed by the principle of *bal tashchit*). Competing uses for this water would likely include the following:

Use	**Grade of Water Required**	**Quantity Available**
Non-essential agriculture for irrigating crops that are not necessary for categories 1-5, but which bring in high profit – such as specialty food crops, flowers and other decorative plants.	For most types of agriculture, *GW* or *WW* can be used – both of which are available at a lower price than *HQFW*.	Total quantity available = (1,600 MCM minus the amount needed to satisfy categories 1 + 2 + 3 + 4 + 5) Estimated range is between 346 MCM (1600 – 454) and 1146 MCM (1600 – 1254) depending on how much water is allotted to the natural environment, and how much is allotted to agriculture for local production of essential food crops.
Non-essential industry – for producing goods and services not necessary for categories 1-5 above.	Preferably HQFW. Where needed, many industries could utilize *GW*, which has a lower price, and purify the *GW* where *HQFW* is required.	
Gardening and landscaping	*GW* (for crops grown for direct human consumption) or *WW* (for crops not grown for human consumption)	
Recreation (swimming, boating, fishing, water parks, aquariums, etc.)	Where humans come in contact with the water (such as swimming and water parks, and consuming fish caught in the water), the water should be microbiologically safe and low in toxic pollutants (HQFW). For boating, lower purity would suffice.	

Table 6.9 - Basic water requirements for category 6 – maximizing economic value

Whereas the amount of HQFW required for meeting the essential needs of categories 1 – 5 is presumed to be inelastic, the amount of HQFW required for meeting the needs and wants of category 6 can be considered to be relatively elastic, depending on the market price.

Water allotment for agricultural and industrial needs

Agriculture is a crucial factor in the management of water. While irrigated agriculture requires a great deal of water (worldwide, irrigation accounts for two thirds of all fresh water use and as much as 90 percent of fresh water use in many developing countries[595]), the economic return on investment for using water for irrigation is considerably lower than the return on investment from using the water for many other uses. For example, Shuval writes[596]: *{...} the marginal value of water and the income produced from its use for the domestic/urban/commercial/industrial and tourist sector has been estimated as being some 100 times greater than its value in agriculture.* Therefore, agricultural activities (excepting those not requiring irrigation, or those activities which rely solely on GW or WW) may not be justified by the model unless they are necessary for satisfying categories 1 through 5.

Shuval recommends against using Israel's fresh water supply for irrigated agriculture. Citing an earlier study, Shuvall writes[597]: *for Middle Eastern countries the economic return on one cubic meter of water allocated to agriculture is about $2.00 (US) while a cubic meter of water used in commerce or industry yields a return of $100 to $500. Such an economy based on commerce, industry and tourism will be able to provide sufficient financial resources to import and store all the food required to assure food sufficiency and as well a higher standard for living for all.*

Whereas agriculture is the heaviest consumer of fresh water, industry usually has more modest needs. In Israel, industry only accounts for 6 percent of total fresh water consumption (see Table 6.2). While a high level of purity is usually required for water used by industry, this water used for industry produces a far higher return on investment then agriculture. To save water, the products of both agriculture and industry can often be imported from other countries, conserving the fresh water that would otherwise be required for producing these goods. The decision whether to locally produce or import these goods is largely based on economic considerations, as Shuvall describes above, as well as security considerations.

The concept of 'Virtual Water'

Tony Allen, who is credited with introducing the name 'virtual water' writes[598]: *Virtual water refers to the water required in the production of a good or service. The water is said to be virtual because once the good is grown, the real water used to grow it is no longer actually contained in the good. The concept of virtual water helps us realize how much water is needed to produce different goods and services. In semi-arid and arid areas, knowing the virtual water value of a good or service can be useful towards determining how best to use the scarce water available.*

Importation of 'virtual water' (for example, the importation of grain, which requires a great deal of water to grow) is an attractive solution to water-stressed areas, such as Israel, who can afford to

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[595] Sandra Postel, 'Growing more Food with less Water', *Scientific American*, February 2001, p. 34.
[596] Hillel Shuval, *The Role of "Virtual Water" in the Water Resources Management of the Arid Middle East*, from the 2nd Israeli-Palestinian - International Conference. Turkey, 10-14 October, 2004, available at http://www.ipcri.org/files/water/water-papers.html.
[597] Ibid.
[598] Tony Allen, 2005, available at: http://en.wikipedia.org/wiki/Virtual_water.

import the majority of their food needs – as long as grain remains abundant and affordable. Lomborg writes[599]: *The fall in the price of food is a genuine long-term tendency. The price of wheat has had a downwards trend ever since 1800, and wheat is now more than ten times cheaper than the price charged throughout the previous 500 years.*

Security Considerations

The above considerations need to be weighed against the security costs of being dependent on food imports. Because grain is vitally important (not only for direct human consumption, but also, indirectly, as feed for livestock, including aquaculture), and since there is no guarantee that Israel will find available, abundant and affordable grain to purchase in the future, Israel (and any other country relying on food imports) should invest now in research and development (*NPC*) for developing better ways to grow staple foods with less water, or with GW and WW. In the meantime, as long as grain remains available, abundant and affordable, it probably makes best sense to keep importing grain rather than growing it in Israel. Likewise, I recommend that Israel invest in research and development towards reducing the consumption of HQFW in industry.

6.2.7 Establishing a minimum amount of fresh water (including HQFW) required for meeting basic human needs, in relation to future population projections

Having examined the application of the hierarchy to the allocation of fresh water (and particularly HQFW) in Israel to meet the basic, and then, non-basic human needs of the current population (approximately 7 million), it would be useful to estimate the amounts required for future population projections. I will return to the already cited study by Gleick on minimal water requirements in the Middle-East, and will combine this with my own estimates, as discussed above. Of particular importance is determining the minimum amount of HQFW that might be required to meet basic human needs for the future.

Gleick writes[600]: *Shuval and Gleick each raised the concept of applying a minimum water requirement in the context of the water disputes in the Middle East. In both approaches, their "minimum" levels included considerable amounts of water required for human uses in addition to the basic needs described above. Shuval set a minimum at 125 cubic meters per person per year* [342 liters/person/day] *in order to satisfy domestic needs as well as modest industrial and gardening needs. Gleick proposes a lower minimum – 75 cubic meters per person per year – also including some industrial and commercial activities. Using the higher levels proposed by Shuval would increase the total minimum demand in the region* [Israel, Jordan and Palestinian Authority] *to 1,200 MCM/yr in 1990 and about 2,800 MCM/yr by 2025. This latter amount approaches the total for the reliable supply in the entire Jordan Basin. Satisfying this larger "minimum" would require taking almost all the water now used to grow food and applying it to meet domestic and industrial needs. This implies major restructuring for the region's agricultural water policy – a re-structuring that has already begun.*

My calculations above show that less than 25 m^3 of the water required for each person/year need to be supplied by HQFW. The remainder of this water can be supplied by lower grade water such

[599] Bjørn Lomborg, *The Skeptical Environmentalist*, (Cambridge, 2001), p. 62.
[600] Gleick, (1996), p.90.

as GW – as long as there is a separate grey water system[601]. The following table examines the minimal amount of each grade of water required to meet the needs of an individual, of the current population (approximately 7 million) and projections of likely future population levels in Israel, based on Shuval's conservative estimate of 125 m^3/person/yr as the minimum water requirement[602].

Water Quality	Water Required (m^3/person/yr)	Water required (MCM) for 7 million population	Water required (MCM) for 9.3 million population	Water required (MCM) for 12 million population
HQFW*	25	175	232	300
GW*	100	700	930	1200
Total**	125	875	1162	1500

Table 6.10 – Water need projections for Israel, excluding agriculture

* Assuming a viable grey water system is available
** Total requirement for HQFW or for HQFW plus GW if viable GW system in use.

As Table 6.10 shows, the minimum amounts of fresh water required for a population of 9.3 million (which is predicted to occur around the year 2025)[603], or for even a near doubling of the Israeli population to 12 million, falls within the estimated sustainable fresh water supply of 1600 MCM. This amount excludes most of the water needed for agriculture, much of which can potentially be supplied by recycled waste water and more efficient catchment of precipitation which is currently lost, as well as by purchasing high-water requiring agricultural goods from areas with lower water stress. This amount also excludes leaving water for the natural environment. As discussed above (section 6.2.6.5), the amount of water needed by natural environment is estimated at 150 MCM, which need not be HQFW. According to the estimates in Table 6.10, this amount of fresh water would be available at a projected population of 9.3 million, though not at a population of 12 million. Any increase in human population would not be expected to greatly influence the amount of water required for the natural environment. Table 6.10 also ignores additional HQFW provided by desalination – which might not be necessary if a viable grey water system is in operation[604]. Finally, and related to the desalination (see section 6.2.4 –

[601] In section 6.2.5 I discussed the use of grey water. There, I broadened the definition of grey water to include seasonably collected storm runoff and surplus untreated water from storage reservoirs (including lightly polluted portions of the aquifers that is not fitting for HQFW). More research needs to be done on the potential quantities available and the feasibility of using 'grey water' as a substitute for HQFW where HQFW is currently being used but is not required.
[602] This estimate was originally published in: Hillel Shuval, 'Approaches to Resolving the Water Conflicts Between Israel and her Neighbors – a Regional Water for Peace Plan', in *Water International*, Vol. 17, (1992), pp. 133-143.
[603] Israel Central Bureau of Statistics, *Projections of Israel's Population until 2025*, Jerusalem, December 2004, available at: http://www.cbs.gov.il/publications/popul2005/pdf/e-mavo.pdf.
[604] The relative merits of using a grey water system to reduce the demand for (and the unnecessary waste of) HQFW versus increasing the supply of available HQFW by desalination depend on a variety of factors, such as fuel costs (high fuel costs increase the price of desalination), public acceptance (desalination requires less changes in public behavior and would be easier to implement) and environmental impact (desalination could be expected to have a significantly greater negative environmental impact because of the need to dispose of the waste brines and the pollution caused by generating the energy required to desalinate the water). The principle of *bal tashchit* would presumably favor the grey water system, since it will reduce the unnecessary degradation of HQFW whereas

political ramifications), this figure doesn't take into consideration natural water that may be ceded to other political entities in the event of a future peace deal.

The minimum requirements for fresh water described above are important for the application of the principle of *bal tashchit*, because they represent a reasonable lower limit of the fresh water that must be supplied to meet basic needs (categories 1 – 5). Beyond this limit, increasing *NQU* (in the form of knowledge, which includes technological innovations, and in the form of righteousness, which includes behavioral modifications that lead to increased water conservation) can be increasingly substituted for some of the fresh water to increase human well-being without having to provide more fresh water.

6.2.8 – Discussion on the application of the principle of *bal tashchit* to the shortage of HQFW in Israel

Fresh water is a vital and threatened resource, particularly in arid and semi-arid regions such as Israel. Properly managing the fresh water supply requires focusing on the quality or *purity* of the water as well the available quantity. The model – which is based on the principle of *bal tashchit* – focuses on the management of *MQU* (water purity in this case) and prioritizes the needs and wants for high quality fresh water (HQFW) to ensure the maximization of human welfare. The model shows that Israel currently has a sustainable supply of enough HQFW to fulfill the *basic needs* of the current population, as well as the basic needs of the projected future population, if the fresh water supply is properly managed. This includes reducing the unnecessary degradation of HQFW, increasing the use of grey water and waste water and increasing the capture of HQFW received through rainfall. The emphasis on increasing production and utilization of *NQU* – through increased education and research and development – plays an essential role in this approach. While the model does not directly address many barriers to effective water management (including budgetary constraints, technical limitations and a myriad of human shortcomings such as lack of responsibility and resistance to positive change) it is suggested that these barriers can also be surmounted through increasing the production and utilization of *NQU*.

The remainder of this section is divided into two parts. First, I will discuss the special importance of water in the model. After that, I will discuss how things were done in the area of water management in Israel in relation to the principles of the model and what can be learned from this comparison.

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increasing the supply of HQFW through desalination would likely increase the unnecessary degradation of HQFW. The government of Israel (who admittedly made their decisions during a sustained period of low fuel prices) is taking the opposite position and focusing on increasing desalination. It is important to note that another factor strongly favoring desalination is the Israeli government's anticipation of a future peace deal with the Palestinian Arabs on the West Bank (where most of the Mountain aquifer is located) and with Israel's other neighbors (primarily Syria) on the Golan Heights (which includes important water sources, and which may include giving Syria a portion of Lake Kinneret as well). Each of these prospects may significantly reduce Israel's supply of natural HQFW.

The special importance of water in the model

I chose to apply the model to the management of HQFW in Israel before fully appreciating how unique of a resource water really is. Because of its special properties (see section 6.2), water can be considered a 'super' resource, which itself plays a major role in the utilization of other resources[605].

Water is a key component of the 'matter' in most resources, as well as in the production and utilization of almost every resource. To go a step further, I suggest that water is a *medium* that carries *MQU* in most resources, and that water plays an important role in incorporating *MQU* into a resource even if the water doesn't remain. For example, Wernick and Ausubel, in researching the total flow of materials through the American economy, write[606]: *We do not explicitly treat water consumption because the mass of this ubiquitous and precious resource would obscure other materials. In 1990, consumptive use of fresh water (defined as water that has been evaporated, transpired, or incorporated into products, plant or animal tissue, and is therefore unavailable for immediate reuse) in the United States exceeded 34 trillion [10^{12}]gallons or about 130 billion [10^{9}] metric tons, some 25 times other inputs.*

It may be suggested that water (as a carrier of *MQU*) belongs in a category of its own, on an equal level with man and trees (as producers of *QU*) in the model. Indeed, water (like trees) is given great importance in the Jewish sources. The Midrash goes so far as to call water "life"[607], and Daniel Hillel writes that the word water appears no less than 580 times in the Tanach[608]. While man represents *NPC* in the model, and trees represent the paradigm of *MPC*, water could be used to represent the paradigm of matter as a carrier for *QU*.

Lessons learned from the water situation in Israel in relation to the principles of the model – observations and conclusions

We can ask the hypothetical question – would the application of the model result in a different situation vis à vis the management of HQFW in Israel today, or were it to have been applied 50 years ago, during the first years of the State? A comprehensive examination of the situation then and now is beyond the scope of this thesis. There is, however, room for a few remarks and observations:

1. Israel can be seen as having started out, in the early to mid twentieth century, in stages 1 and 2 of development (see chapter four, section 4.4). Much of the infrastructure, particularly outside of the few already existing cities, had to be built. By the end of the century, most of Israel had moved up to stage three of development. Despite the challenges, and the great difficulties that had to be overcome, Israel has been able, throughout its short history, to provide its citizens with a sufficient supply of HQFW to satisfy their basic needs (categories 1- 4 as described in section 6.2.6). This was accomplished over a period where Israel's population grew from 650,000 in 1948 to over seven million today, and as the GNP and material standard of living greatly increased.

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[605] Since water plays such a vital role for man and virtually all living organisms, one can ask philosophically: Is water so ubiquitous in living organisms because it is needed for transporting *QU* into and *negative QU* out of the organisms, or, is water used as a medium for transporting *QU* and *negative QU* because it is already, necessarily, a major component of every living organism?

[606] Iddo K. Wernick and Jesse H. Ausubel, 'National Materials flows and the Environment', *Annual Review of Energy and the Environment*, 20:463-492, (1995).

[607] Midrash Avot of Rabbi Natan 34:10. מים נקראו חיים

[608] Daniel Hillel, *Rivers of Eden: The Struggle for Water and the Quest for Peace in the Middle East*, (Oxford, 1994), p.26.

2. Significant amounts of HQFW were also provided for non-essential needs (category 6). In many cases, this was done irresponsibly. For example, the provision of heavily-subsidized water to the agricultural sector encouraged growing non-essential crops with a high water requirement (such as cotton) which was inappropriate, given the water situation.

3. These achievements were attained, largely, at cost of the neglect and abuse of the natural environment (category 5). Israel's natural water storage areas were overexploited to a harmful degree, and the ecological system was degraded. For example (as discussed in section 6.2.6), the watershed of the lower Jordan River, as well as the Hula wetlands were drastically altered in a way that severely reduced their ability to provide important ecological services.

4. While providing HQFW for category 6 needs at the expense of the natural environment (category 5) runs counter to the hierarchy, some of the environmental destruction that took place was at least partially justified in relation to the model. It was reasonable and proper to make (temporary and limited) sacrifices of the environment in order to provide for the basic human needs of categories 1 - 4. For example, draining parts of the Hula wetlands, while partially done to provide more agricultural land (which probably fits into category 6) was also done to help control malaria-carrying mosquitos – which were significantly harming the human population (categories 1-2). This was certainly consistent with the hierarchy. According to Tal[609], before the draining of the Hula, malaria was considered a "scourge of staggering proportions" and regarded as the number one public health enemy in the region. Tal continues[610]: *Some environmentalists point to the ecological price of the initiative [to control malaria in Israel]: massive habitat destruction as well as reliance on a persistent and ecologically insidious chemical [DDT]. Public-health practitioners, as well as the families of the two million people around the world who even today are lost each year to the disease, would see it differently. In this dilemma of competing environmental values, it is not surprising that Zionists chose an anthropocentric, people-first approach. In this way, Israel is no different from other Western and developing nations.* What was not justified, in relation to the model, were the sacrifices of the natural environment made in order to satisfy some of the hubristic goals of earlier Israeli governments[611].

5. It is difficult to objectively judge the decision-makers of the past, especially in light of the tremendous accomplishments of the period. While the productive natural environment should have been better protected, it is important to realize that the knowledge and understanding of the ecological services provided by the environment was limited – particularly amongst the decision-makers.

6. Today, the situation in Israel is certainly moving closer to the model. Water management is improving – particularly in terms of the protection of the productive natural environment. Israel has also made tremendous progress in the reuse of recycled waste water. In addition, water-wasting agricultural practices have been significantly reduced.

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[609] Tal (2002), p.61.
[610] Ibid.
[611] See for example Tal (2002), who lists many examples of the ecological damage caused by the idealogical excesses of the Israeli government. For example, the romantic Zionist goal of "making the desert bloom" overruled responsible thinking in diverting HQFW from the natural water system in the north (which was perhaps irreparably damaged) in order to irrigate parts of the desert in the arid south.

7. The need for the production of additional HQFW through desalination is quite complex. Certainly, it would be justified to produce HQFW through desalination in order to meet the basic needs in categories 1 – 4. According to the model, there is already enough of a sustainable supply of HQFW to satisfy basic human needs in categories 1-4. Where additional HQFW might be needed is for (possibly) category 5 – the natural environment, for category 6 (economic needs), and in the event of the ceding of large portions of Israel's natural water supply to foreign governments in the event of a peace deal. I will touch on each of these points below:

    A. *Desalinating water for the natural environment* – It is far from certain that the benefits to the natural environment from the additional water available to them from desalination will outweigh the costs (see section 6.2.4).

    B. *Desalinating water for meeting non-essential economic* needs – the soundness of using desalinated water for non-essential economic needs depends on the costs and benefits involved, which should include the environmental costs of added pollution from generating the energy to desalinate water and from the disposal of the waste brines (highly concentrated salts and other impurities) produced by the desalination process. If producing desalinated water will provide more benefit for category 6 users (such as those listed in Table 6.6) than the costs involved in producing it, then it would seem to make sense to desalinate. As it is, Israel's decision to invest heavily in desalination facilities – which are very expensive and which are heavy energy-users – seems questionable – especially at current oil and gas prices. To the extent that Israel can utilize solar energy – which is available in great abundance, particularly in the locations (south) and at the times of the year (summer) where there is the greatest need – desalination becomes a more attractive option. This would appear to be a particularly fruitful area for research.

    C. *Desalinating water in the event of a peace deal* - The political situation is also very uncertain. In the best-case scenario, a real and secure peace will be concluded between Israel and its neighbors and Israel develops sustainable large-scale renewable-energy-powered desalination. Israel's neighbors, to whom it has ceded much of its natural supply of HQFW, use these natural water storage areas, some of which will continue to be shared (such as, possibly, the Kinneret) sustainably without further damaging or destroying them. Is this realistic? The risks of a more pessimistic scenario are daunting. If there is no real peace and security, If large-scale renewable-energy-powered desalination proves impractical (and Israel is forced to be dependent on imported fuel, as well as deal with the additional environmental problems, including reducing greenhouse gas emissions from conventional desalination plants), or if Israel's neighbors further damage or destroy the natural water storage areas, then the situation for the region may be significantly worse than the present. In addition, by taking the preparatory steps of investing heavily in desalination plants, as Israel is doing, Israel gives up an important bargaining chip by giving up its claim to having a pressing need for the natural water sources upon which it now depends.

8. Most importantly, perhaps, from the point of view of the model, is that Israel has substantially increased its *NQU* (knowledge) relative to the sustainable management of water resources, which will be of great long-term benefit both to Israel and to other countries that can benefit from this knowledge. While the production and development of *NQU* in the water sector was allowed to stagnate during much of the last two or three decades, a new emphasis on increasing *NQU* in this sector through education and research and development has taken root in recent years.

9. The great hope and expectation with the water situation in Israel is that sufficient investment in *NPC* now and in the future will allow Israel to cope with the challenges of supplying sufficient HQFW to supply all of the human needs and wants despite the expected significant increases in both population and standard of living and with a relatively limited natural water supply. This should include advances in desalination and other water purification technologies as well as better grey-water systems and increased capture of runoff water to increase the efficiencies and lower the costs. The alternatives, without a significant increase in *NQU*, are stark indeed.

10. Israel's decision makers operated, and to some extent, continue to operate without sound sustainable principles, such as the principle of *bal tashchit*. For example, when explaining the situation that led to Israel's water crisis, former Israeli water commissioner Meir Ben Meir laments[612]: *Within this maze one wishes or expects the squaring of the circle – to allocate water to a modern agricultural sector, that is capital investment intensive, that was developed beyond the feasible supply of water, to comply with the urban demand that is growing by about five percent per annum, to fulfill political obligations (to Jordan and the Palestinians), and at the same time to preserve the water sources from depletion and contamination. In other words, to prevent a deficit in a system, in the actual structure of which a deficit is in-built.* Without sound sustainable principles, Israel's attainments in the management of HQFW were arrived at, largely, through *trial and error*[613]. Ben Meir's quote reveals that allowing the degradation of *MPC* (through overdrawing and seriously damaging the water system) was built into the decision-making 'system'. Had Israeli decision makers used an overall guiding principle like the principle of *bal tashchit* (which was, indeed, part of the heritage of the people and the land), much of this trial and error could have been avoided along with many of the expensive errors that continue to extract a heavy price from the ecological system and those who depend on it. In all probability, if the principle of *bal tashchit* had been followed, there would not have been such a level of degradation of *MPC*. The principle would have also mandated a greater production of *NQU* (knowledge and righteousness) in the Israeli population, which could have greatly benefited Israel and the entire world.

11. Israel's endemic water shortage forced water conservation. Had water been more plentiful, Israel (without the principle of *bal tashchit*) would not have become nearly as water efficient. A principle like *bal tashchit*, on the other hand, mandates conservation and efficiency even where there is not a shortage. This is

[612] Parliamentary Committee Report, p.67.
[613] Tal (2006), p.1081.

an important point when one considers the level of waste taking place in much of the world, where actual shortages and/or high prices don't force the conservation of material resources.

6.3 – Application of the principle of *bal tashchit* to a wider scope of environmental problems (Climate Change and Loss of Biodiversity)

While the previous section focused on what was primarily a shortage of resources (HQFW), many of the most serious and pressing environmental problems, as described in the M.A. report, involve undesirable *changes* in the environment, rather than actual scarcities of resources. Two examples of this type of problem are *climate change* and *loss of biodiversity*. How might the principle of *bal tashchit* address each of these? In this section I will briefly discuss the problems of climate change and reduced biodiversity in relationship to the principle of *bal tashchit* as described in this thesis.

Using the nomenclature introduced in chapter four, both the climatic system and the natural biota making up the earth's amazing native biodiversity can be classified as *MPC* – producers of benefit for man. Both are included with the *ecosystem services* listed in the M.A. report[614]. Climate change is classified within *regulation services*, while reduced biodiversity can be said to affect all four categories of ecosystem services listed[615]. Climate change and loss of biodiversity are problems representing the degradation of *MPC* – or ecosystem services provided by the natural environment.

6.3.1 Climate Change

The natural environment regulates the climate, keeping factors such as temperature and precipitation within certain ranges in a tremendously complex, and still poorly-understood interaction between a myriad of different elements in the environment. While the climate naturally changes over time, there is increasing evidence that man's actions are contributing to undesirable climate change, with consequences that include higher temperatures, higher frequency of extreme weather events, and significant rises in sea level[616].

According to the model, anthropogenic climate change can be seen as example of man's degradation of the producers of ecosystem services, in this case, the regulation services that produce a more stable and desirable climate. Anthropogenic climate change is believed to result from a significant increase in the level of 'greenhouse gases' such as carbon dioxide, methane and nitrous oxide in the atmosphere as a result of human activities – particularly the combustion of fossil fuels[617], as well as the decimation of many of the potentially carbon-absorbing forests. Deforestation is estimated to indirectly contribute up to 20 percent of the world's annual carbon dioxide emissions[618].

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[614] *M.A. Report*, preface p. *v*.

[615] Biodiversity can play a role in each of the services (supporting, provisioning, regulating, and cultural services). For example, a wide variety of living organisms contribute to soil formation (supporting services), food production (provisioning services), water purification (regulating services) and aesthetically-pleasing landscapes (cultural services). The absence of these organisms may have a deleterious affect on these ecosystem services.

[616] See for example, William Collins, Robert Colman, James Haywood, Martin R. Manning and Philip Mote, "The Physical Science behind Climate Change", *Scientific American*, (August, 2007), p.56; Richard A. Kerr, "Pushing the Scary Side of Global Warming", *Science*, vol. 316 (June, 2007), pp.1412-1415.

[617] One possible way to look at climate change, from the perspective of *bal tashchit*, is to say that man has degraded the natural quality or order of the climatic system by his actions. For example, carbon was 'ordered' under ground, in deposits of coal, oil, gas. This carbon is now being released into the atmosphere as carbon dioxide, as a result of burning these fossil fuels. The matter and energy in the fuel has been degraded by man from a concentrated, ordered form, with significant *MQU*, to a dispersed, disordered form, with negative *MQU*.

[618] M.A. report, p.111. Deforestation's contribution to CO_2 emissions is through the release of CO_2 from burning or degrading trees and soils as well as the CO_2 no longer taken up by the removed trees.

According to the M.A. report[619]: *Humans have substantially altered regulating services such as disease and climate regulation by modifying the ecosystem providing the service and, in the case of waste processing services, by exceeding the capabilities of ecosystems to provide the service. Most changes to regulating services are inadvertent results of actions taken to enhance the supply of provisioning services. Humans have substantially modified the climate regulation service of ecosystems—first through land use changes that contributed to increases in the amount of carbon dioxide and other greenhouse gases such as methane and nitrous oxide in the atmosphere and more recently by increasing the sequestration of carbon dioxide (although ecosystems remain a net source of methane and nitrous oxide).*

According to a recent report from the Intergovernmental Panel on Climate Change (IPCC)[620]: *Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land-use change, while those of methane and nitrous oxide are primarily due to agriculture. Carbon dioxide is the most important anthropogenic greenhouse gas. The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm [parts per million] to 379 ppm in 2005. The atmospheric concentration of carbon dioxide in 2005 exceeds by far the natural range over the last 650,000 years (180 to 300 ppm) as determined from ice cores. The annual carbon dioxide concentration growth-rate was larger during the last 10 years (1995 – 2005 average: 1.9 ppm per year), than it has been since the beginning of continuous direct atmospheric measurements (1960 – 2005 average: 1.4 ppm per year) although there is year-to-year variability in growth rates.*

Addressing climate change with the principle of *bal tashchit*

Applying the principle of *bal tashchit* to climate change requires first establishing that climate change negatively affects man either directly (the first four categories of the hierarchy) or through the degradation of the ability of the environment – life-support system to produce and provide benefits for man (categories five and six). It also requires establishing which of man's actions are causing, directly or indirectly, this degradation. Since I am only taking a hypothetical look at how the principle of *bal tashchit* might be applied to climate change I will simply state these points rather than enter into the debate on either of them. The degree of certainty required in establishing each of these points is not clear to me, but when discussing damage to man or *MPC*, less certainty would be required than when discussing damage to *MQU*.

Leaving aside the question of whether the activities that might be contributing to anthropogenic climate change (such as pleasure driving in a fossil fuel powered automobile) would involve any violation of *bal tashchit*[621], it is important to note that most of the measures proposed for addressing climate change and stabilizing the climate are consonant with the principle of *bal tashchit*, independent of their impact on the climate. For example, Pavala and Socolow propose

[619] Ibid, p.47.
[620] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: The Physical Science Basis*, Summary for Policymakers, (February, 2007), p.2. Available at: http://www.ipcc.ch/SPM2feb07.pdf.
[621] In my opinion, pleasure driving may be a violation of the principal of *bal tashchit* if it can be reasonably established that this activity is causing unnecessary degradation to categories 1 – 5 in the hierarchy (for example, through the direct air pollution caused, and/or the indirect effects of climate change).

five areas of changes, using existing technologies, needed to stabilize the earth's climate[622]. These five areas (which Pavala and Socolow subdivide into fifteen 'stabilization wedges') are:

1. Increasing energy efficiency and conservation
2. Fuel shift from coal to natural gas
3. CO_2 capture and storage
4. Increasing usage of nuclear power
5. Increasing use of renewable electricity and fuels (wind, solar, hydrogen and biomass)
6. Forest and Agricultural soils (reducing deforestation, plus reforestation, afforestation, new plantations and conservation tillage).

Of these six areas, the principle of *bal tashchit* would clearly mandate the first (increasing energy efficiency and conservation), the fifth (increasing use of renewable energy[623]) and the sixth (reducing deforestation and increasing forestation), and may also favor the other three, with the proviso that the utilization of each measure must fit within the hierarchy described in chapter five. For example, if a measure for increasing energy efficiency requires sacrificing any of the first 5 categories in the hierarchy (human life, health, dignity, religious duties, or *MPC*) than it would not be recommended.

A key issue in applying the principle of *bal tashchit* is ensuring that every measure employed optimizes human welfare. Therefore, we must ask, will the investment in climate stabilization strategies be the best way to maximize human welfare? This is a matter of current debate. While there is a growing consensus for adopting some, if not all of these strategies, there is also opposition. For example, Lomborg writes[624]: *{...} I asked 24 U.N. ambassadors – from nations including China, India and the U.S. – to prioritize the best solutions for the world's greatest challenges, in a project known as Copenhagen Consensus. They looked at what spending money to combat climate change and other major problems could achieve. They found that the world should prioritize the need for better health, nutrition, water, sanitation and education, long before we turn our attention to the costly mitigation of global warning.*

Lomborg's recommendation appears to be consistent with the principle of *bal tashchit* as described in this thesis, in placing human health, nutrition, water, sanitation and education above the mitigation of climate change, *as long as* the climate change is not threatening the first four categories in the hierarchy (human life, health, dignity and religious duties). It is not clear what Lomborg is referring to when he writes of the "costly mitigation of global warming" that should be addressed only after spending money on other major problems. Some measures, such as increasing energy efficiency and the increased use of some renewable energy sources (such as solar water heaters and wind power) may be expected to save money, particularly in the long run. By grouping all of the measures together under the rubric of 'costly mitigation' strategies, Lomborg's statement is misleading, in my opinion. Some of the costly strategies (such as the massive underground storage of carbon dioxide) perhaps should be shelved in favor of addressing other

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[622] Stephen Pacala, Robert H. Socolow, "Stabilization Wedges: Solving the Climate Problem for the next 50 years with current technologies", *Science*, vol. 305 (August 13, 2004), pp. 968-972.

[623] Since most of these renewable energies are based on incoming solar energy (for example solar and wind power), rather than on the combustion of fossil fuels (which, as described in chapter four, section 4.1.7.C, causes an overall degradation of *QU* within the earth's ecosystem), the substitution of these renewable energies can result in a net gain in *QU*, and contribute to man's long-term welfare.

[624] Bjørn Lomborg, "Climate Change, the Stern Review, The dodgy numbers behind the latest warming scare", *The Wall Street Journal*, (November 2, 2006), available at: http://www.opinionjournal.com/extra/?id=110009182.

pressing problems, while some of the strategies, such as increasing energy conservation, should be vigorously pursued.

Another interesting aspect of climate change is the equity issue. Most of the elevations in carbon dioxide levels over the past two centuries resulted from economic development in the western world (particularly Europe and North America). Recently, China (a rapidly developing economy) has overtaken the United States as the largest emitter of carbon dioxide, and another rapidly developing economy - India - may not be far behind. Additionally, undeveloped or developing countries who have contributed the least to the problem may suffer the worst effects of climate change. While the principle of *bal tashchit* does not directly address these equity issues, it is possible to argue that the developed world, which historically contributed most to the elevated carbon dioxide levels, should contribute the most to the amelioration. This would be primarily in terms of sharing the technical knowledge (*NQU)* and giving technical assistance to developing countries for both reducing their emission of greenhouse gases and for better coping with the changes brought about by climate change. This could also include increasing general aid and education in poorer countries, to help them better meet the basic human needs of their populations, and enable them to produce more *NQU*, which in long term may be more effective in dealing with problems such as climate change. While developing countries are increasing their standard of living, which will increase consumption levels and the stress on the natural environment that we all share, the developed world can help by contributing the *NQU* (knowledge) needed to minimize the environmental impact of this development.

6.3.2 Loss of Biodiversity

Another current environmental issue is the loss of biodiversity. There are different kinds of biodiversity, which Miller describes as follows[625]: *One important potentially renewable resource for us and other species is biological diversity or biodiversity, which consists of the different life-forms (species) that can best survive the variety of conditions currently found on the earth. Kinds of biodiversity include (1) genetic diversity (variety in the genetic makeoup amoung individuals within a single species), (2) species diversity (variety among the species found in different habitats of the planet, and (3) ecological diversity (variety of forests, deserts, grasslands, streams, lakes, oceans, wetlands, and other biological communities).*

All of these types of biodiversity are being threatened by man's actions. According to the M.A. report[626]: *humans are fundamentally, and to a significant extent irreversibly, changing the diversity of life on Earth, and most of these changes represent a loss of biodiversity.*

Addressing loss of biodiversity with the principle of bal tashchit

As with climate change, applying the principle of *bal tashchit* to loss of biodiversity requires establishing that this loss negatively affects man either directly or through the degradation of the ability of the environment – life-support system to produce and provide benefits for man. It also requires establishing that man's actions are causing, directly or indirectly, this degradation. The link between human actions and the loss of biodiversity seems to be clearly established, though

[625] Miller, p.12.
[626] M.A. Report, p.4.

the effects of the loss of biodiversity on the wellbeing of man and his environment seem less conclusive.

Biodiversity is generally considered to be beneficial to man. For example, the M.A. report finds that[627]: *positive synergies often exist among regulating, cultural, and supporting services and with biodiversity conservation*. The report also finds that[628]: *The loss of species and genetic diversity decreases the resilience of ecosystems, which is the level of disturbance that an ecosystem can undergo without crossing a threshold to a different structure or functioning*.

On the other hand, a proven link between biodiversity and the stability or resiliency of the environment is difficult to establish. Ives and Carpenter write[629]: *Historically, the relationship between diversity and stability has been contentious. Different theoretical results contradicted each other, empirical results were inconsistent, and theoreticians and empiricists often disagreed.* Ives and Carpenter conclude that[630]: *Diversity is not a primary driver, but it might be a secondary driver [for changing an ecosystem]. A key consideration is that if anthropogenic change decreases diversity, it will likely do so in a nonrandom way, as specific species are encouraged or eliminated by human action. In this case, the effects of loss of diversity cannot be disentangled from the effects of changing species composition, making the secondary effect of diversity on production understandable only in the context of the primary driver changing the ecosystem*.

It is important to note that the biotic, or living components of the natural environment often play the role of producers of *MQU* for man. They tend to be, in the composite, renewable and capable of producing continuous benefits for man (with the continuation of generations of the living organisms). Therefore, they generally warrant greater protection, under the principle of *bal tashchit*, than the non-living, or abiotic parts of the natural environment. An exception to this are the natural systems, such as the hydrological system or the climate system which may also be classified as *MPC* even though they consist of, largely, abiotic components.

Chapter three (section 3.2.2.4) described how, according to Jewish tradition, everything in the world was created for the benefit of man, although man often lacks the knowledge required to recognize this benefit[631]. Therefore, it would seem that according to the principle of *bal tashchit*, everything that exists[632] should be protected from extinction[633]. Indeed, Jewish tradition stresses

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[627] Ibid. p.47.
[628] Ibid. p.12.
[629] Anthony R. Ives and Stephen R. Carpenter, "Stability and Diversity of Ecosystems," *Science*, vol. 317 (July 6, 2007), p.58.
[630] Ibid. p.62.
[631] Undeniably, there are many natural objects whose potential benefit is waiting to be discovered. For example, the pacific yew (*Taxus brevifolia*) tree was long considered a pest with no beneficial uses for man. Only later (in the 1960's) the pacific yew was discovered to contain the anti-tumor compound called Taxol which is the basis of an entire new line of cytostatic drugs which are of great benefit to man. There are doubtlessly many similar cases to be found in nature. One possible approach to the dilemma of protecting objects which provide no *known* benefits, and which may even be considered nuisances, is to ensure that each *species* is preserved, even if individual representatives of the species are not protected until they are recognized to be a resource. This is already being done to some extent with protected areas, and seed banks. In my opinion, we should protect some (enough to ensure the survival of the species) from each species under the likely assumption that at some point the benefit will be found – in which case each *individual* is protected from by the principle of *bal tashchit*.
[632] The question can be asked: What about organisms that cause terrible human diseases such as smallpox? What benefit do they provide, and does it justify the terrible human cost? Shouldn't these be totally eliminated, if possible, rather than preserved, where they could possibly be accidentally reintroduced into the human population? I have no clear answer to these questions. It might be possible to suggest that the genome be preserved, for research purposes, without preserving any living species.

the importance of the preservation of each species. For example, in the Biblical account of the great flood[634], Noah was commanded to save a mating pair from each species on the earth in order to preserve all of them for the new post-flood world.

Likewise, Nachmanides writes[635]: *Scripture does not permit us to engage in destruction, to uproot a species, even through it does allow the slaughter of [individual] animals of that species*.

If preserving biodiversity is required, the question is what is the best approach? The principle of *bal tashchit* would require an approach that focuses on maximizing human welfare. Kareiva and Marvier propose approaching the protection of biodiversity in a way that makes human health and wellbeing central to the conservation efforts, which appears to be consistent with the principle of *bal tashchit*. They advocate focusing on protecting those ecosystems most vital to people's health and material needs, writing[636]: *Casual observers do not always see links between human well-being and aiding endangered species, but such connections abound in many situations that engage conservationists. Ecosystems such as wetlands and mangrove stands protect people from lethal storms; forests and coral reefs provide food and income; damage to one ecosystem can harm another half a world away as well as the individuals who rely on it for resources or tourist revenue. Despite these mutual dependencies, the public and some governments increasingly view efforts to preserve biological diversity as elevating the needs of plants and animals above those of humans. To reverse this trend – and to better serve humanity and threatened organisms – we and a growing number of conservations argue that old ways of prioritizing conservation activities should be largely scrapped in favor of an approach that emphasizes saving ecosystems that have value to people. Our plan should save many species, while protecting human health and livelihoods*.

6.4 Summary

From the theoretical application of the principle of *bal tashchit* to current environmental problems, it appears that there has been a convergence between this approach and other approaches that have developed over recent years. For example, the management of HQFW in Israel has become more conservation-minded, with more emphasis on protecting the natural recharge and storage areas (*MPC*), and reducing the unnecessary consumption of *MQU* (water purity in this case) by the agricultural sector. Many of the proposed measures for addressing climate change and loss of biodiversity are also very consistent with the principle of *bal tashchit*, as described above in section 6.3.

The principle of *bal tashchit* takes a preventative approach, mandating the conservation and protection of resources irregardless of their ownership or abundance. Additionally, where the destruction and degradation of resources is permitted, there is an impetus to, wherever possible,

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[633] Along these lines, it would seem that the protection of each species would extend to each geographical area, where each species in that area should also be protected, unless known to be harmful to man. If a species must be removed from any area it should be kept alive and transplanted, if possible, in line with what I wrote in chapter three (section 3.2.1.5E).

[634] Genesis 6:19-22.

[635] Nachmanides, commentary on Deuteronomy 22:6:

> כי יקרא קן צפור לפניך גם זו מצוה מבוארת מן אותו ואת בנו לא תשחטו ביום אחד (ויקרא כב כח) כי הטעם בשניהם לבלתי היות לנו לב אכזרי ולא נרחם, או *שלא יתיר הכתוב לעשות השחתה לעקור המין אע"פ שהתיר השחיטה במין ההוא*, והנה ההורג האם והבנים ביום אחד או לוקח אותם בהיות להם דרור לעוף כאלו יכרית המין ההוא (רמב"ן על דברים פרק כב פסוק ו)

[636] Peter Kareiva and Michelle Marvier, "Conservation for the People," *Scientific American*, (October, 2007), p.27.

both minimize the damage and to substitute *NQU* (increased knowledge and righteousness) for the loss of *MQU*. Therefore, it is possible to argue that many environmental problems, such as the ones described above, could have been minimized, if not prevented had such a principle been employed.

The use of the hierarchy – as was done with the management of HQFW in section 6.2 – provides a relatively orderly method for allotting scarce resources, without depending on subjective and controversial estimates of the monetary value of human life, health and dignity and other non-marketed goods and services. This allotment is done in a way that can be expected to maximize long-term human welfare. When managing scarce resources such as HQFW, it seems that the problem is not necessarily having enough of the resource to meet the basic human needs of the population, but rather, from the conflict in trying to implement other goals which are rarely transparent or sustainable. For example, much of the damage done to Israel's natural water storage systems resulted from the implementation of ambitious agricultural projects of dubious value to the welfare of the population. Using the hierarchy forces a level of objectivity and transparency which may be expected to lead to greater equity and responsibility amongst decision-makers.

Admittedly, a large part of the problem with the management of the environment today seems to be a lack of political will to follow 'sustainable' principles, especially when they conflict with other interests, rather than an ignorance or lack of these principles. There is no guarantee that a principle like *bal tashchit* would be followed more closely than other principles that have been ignored or neglected. The fact that the principle of *bal tashchit* is based on the Hebrew Bible may have some effect on some populations, and zero effect on others.

The following chapter will summarize what has been learned from this and the previous chapters followed by conclusions and recommendations.

Chapter 7 – Discussion and Conclusions

As stated in the first chapter, the aim of this thesis is to answer the following three questions: 1) *What exactly is bal taschit?* 2) *How can bal tashchit be applied to current environmental problems?*, and 3) *what can bal tashchit contribute to our current understanding and ability to manage our natural environment?* I will address each of these questions separately, followed by conclusions and recommendations for further research.

7.1 What exactly is *bal tashchit*?

Answering this question first required examining the classic Jewish texts upon which *bal tashchit* is based. Starting with chapter two, the investigation of Deuteronomy 20:19-20 revealed a surprisingly rich symbolic relationship, in Jewish tradition, between man and the fruit-producing trees of Deuteronomy 20:19-20. The trees depicted in these verses were shown to symbolize man's natural environment life-support system, progressive growth and development and elevated status as a producer of benefits for himself and the entire world. In the third chapter, a comprehensive investigation of the prohibition of *bal tashchit* brought into the discussion a number of rulings and other important points from which to build a *principle* of *bal tashchit*, as summarized at the end of the third chapter. This included a scope of coverage of the prohibition, indications of a hierarchy of levels of protection, based on benefit to man, and a link between *bal tashchit* and man's level of knowledge and moral ethical behavior.

Based on this textual analysis, *bal tashchit* was expressed as a wide-ranging prohibition against needlessly destroying or degrading anything that can provide benefit to man. This included, first and foremost, human life and health, then the producers of benefits, and then, other objects that provide benefits for man. *Needless* destruction was defined as any destruction resulting in a net loss to the welfare of man. *Benefits* were defined as anything that satisfies the needs or wants of man and add to his wellbeing. An important distinction was made between the producers of benefits (symbolized by fruit-producing trees) and providers of benefits (symbolized by the fruits).

As described in the Jewish texts, however, the legal prohibition of *bal tashchit* is obligatory only upon the Jewish people, and limited to situations of clear, quantifiable damage to objects that are known to be of measurable value to man. Nevertheless, there are many indications, particularly in the work of Maimonides and R. Samson Raphael Hirsch, that a much broader principle of *bal tashchit* can be derived from these texts. Therefore, in my opinion, there is a solid basis for describing *bal tashchit* as a broad-based principle for preventing and addressing environmental problems. In the fourth and fifth chapters, I set about clarifying this principle.

7.2 How can *bal tashchit* be applied to current environmental problems?

Answering this question required translating *bal tashchit* into a wider principle that can be expressed in more contemporary terms. Starting with chapter four, I began a transition from Jewish tradition to a more universal principle by integrating some of the salient points from chapters two and three with concepts from modern western thought.

As I discussed in chapter four, Jewish tradition takes what I am calling a 'utilitarian' approach to the created world, asserting that man is entitled to use and benefit from the natural world in order to satisfy his needs and wants[637]. This is balanced by the assertion that the world and all of its resources belong to the Creator, and man's entitlement to use these resources is limited. The principle of *bal tashchit* limits man's use of the natural world by prohibiting the *needless* degradation of any resources – requiring that the benefits to man from the usage of the resources must exceed the costs of the degradation caused.

It is important to stress that Jewish tradition is *theocentric* rather than anthropocentric. Despite taking a 'utilitarian' view of the natural world, Jewish tradition does not denigrate the natural world – the handiwork of the Creator – nor does it, in my opinion, consider the natural world to be less important in absolute terms than it is in the eyes of the most ardent nature-lover. Nevertheless, Jewish tradition elevates man's status over that of nature because of man's innate dignity – as a being created in the image of the Creator. Only man's great importance, by virtue of his being created in the image of the Creator, permits him to destroy another part of the Creator's creation, if the need is sufficient, according to the principle of *bal tashchit*[638].

To help illustrate the 'utilitarian' approach, I introduced a concept I call *QU*[639] (along with its derivatives, *MQU*, *NQU*, *MPC* and *NPC*), which are employed as an explanatory device to express that part (and ultimately, all) of the environment which produces and provides benefit for man, and is therefore protected by *bal tashchit*. Returning to the important relationship between man and fruit-producing trees discussed in the second chapter, I described how man is also part of the system of producing benefits, through his production of *NQU* (knowledge and what I am calling 'righteousness'), which provides benefit for him and the world around him.

7.2.1 – The concept of Quality-Utility (*QU*) in relation to *bal tashchit*

In the fourth chapter (section 4.2.4), I describe *bal tashchit* as an approach for the management of that which provides benefits for man, or *QU*. *Material QU* (*MQU*), is incorporated into matter and energy and is constantly being degraded or consumed in the earth's ecosystem, and therefore, must

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[637] In my opinion, the 'utilitarian' approach described for the principle of *bal tashchit* is justified by man's primary role as a producer of *NQU* which enables the world to progress and reach higher levels. Without man, the natural world can perhaps attain a high level of stability and harmony – but not progress to a higher level of *conscious* existence. In the words of Nobel laureate George Wald (George Wald, *Scientific Endeavor*, U.S. National Academy of Sciences, 1965, p.134): *Surely, this is a great part of our dignity as man – that we can know, and that through us matter can know itself; that beginning with protons and electrons, out of the womb of time and the vastness of space, we can begin to understand; that organized as in us, the hydrogen, the carbon, the nitrogen, the oxygen, those sixteen to twenty elements, the water, the sunlight – all, having become us, can begin to understand what they are, and know how they come to be.* From this perspective, *man* is the 'consciousness' of the world – and the facilitator for the world to reach its designated purpose. Therefore, a 'utilitarian' approach fits in with the overall plan for the creation – *as long as* man fulfills his role.

[638] See chapter five (section 5.2.3.3) for more discussion on this point.

[639] *QU* is an abbreviation for 'Quality-Utility' which was introduced in chapter four (section 4.24). See the guide to terms and abbreviations for a description of the abbreviations used in this thesis.

be constantly replenished. Even more important to man than *MQU* is *non-material QU* (*NQU*) – such as knowledge and 'righteousness'. *NQU* enables and greatly enhances man's ability to utilize the resources around him in a sustainable way.

The amount of *QU* available to man is dependent on the productive capacity of the natural environment (symbolized in Jewish tradition by fruit-producing trees) for producing *MQU* and on the productive capacity of the human population for producing *NQU*, as well as the ability of man to protect and conserve these resources. By maximizing the productive capacity (*PC*) and minimizing waste, man can increase the amount of available *QU*, to maximize his well-being in this world in a 'sustainable' way. This, in my opinion, is the ultimate goal of resource management. The ability of the human population to produce *NQU* is the key, because with enough *NQU*, the resource base becomes far less limited.

7.2.2 – The hierarchy of human needs

In chapter five I further develop the principle of *bal tashchit*, introducing a formal hierarchy for the utilization of *MQU*[640]. This hierarchy emphasizes the progressive development of man as a key component in the management of material resources, including the importance of human dignity (which relates to the potential for producing benefits)[641]and education, including moral-ethical education.

As I wrote in the fifth chapter, every individual and every group unavoidably prioritizes how to utilize their resources. This prioritization is often subconscious, and is rarely formalized or made public, but the priorities are revealed through the choices that are made. When authorities decide there is not enough money in the budget for cleaning up a polluted lake, or choose to build a shopping mall over a natural wetland, they are expressing priorities no less certain than those included in the hierarchy. Similarly, when Israeli authorities decided to divert fresh water resources from natural areas in the north to the arid south, for the sake of growing water-hungry, but non-essential crops, they were also acting from national priorities. When Nigerian authorities use oil profits for building expensive private villas rather than investing them in healthcare and education for their citizens, they are also expressing their priorities. But who sets these priorities, and on what basis?

I endeavor to show, in the fifth chapter, that the classical Jewish texts that are the basis for the principle of *bal tashchit* also reveal, upon examination, a hierarchy, or set of priorities for acting according to the principle of *bal tashchit*. This hierarchy is, in my opinion, an indispensable part of the principle of *bal tashchit*. Any prohibition of *unnecessary* destruction or degradation, *de facto* requires a hierarchy of this nature, in order to sort through the tradeoffs – otherwise, how are we to judge what is necessary and what is not?

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[640] To review, the hierarchy goes as follows (see section 5.2.1 for more detail):

1. To preserve and enhance human life.
2. To preserve and enhance human health and wellbeing
3. To preserve and enhance human dignity
4. To observe religious duties (mainly education)
5. To preserve and enhance *MPC* (producers of benefits for man)
6. To allocate all surplus *MQU* in the most economically efficient way, in order to maximize the welfare of man.

[641] See chapter five (section 5.2.3.5) for a more detailed discussion of the importance of dignity, and how dignity relates to the production of benefits.

Acting according to the hierarchy, even where resources are degraded or destroyed, is consonant with the principle of *bal tashchit*, whereas a deviation from this hierarchy would violate the principle of *bal tashchit*. A common violation of this hierarchy in Israel and most of the world today is the consumption and degradation of resources to satisfy non-essential needs and wants (category six in the hierarchy – see chapter five, section 5.2) at the expense of the protection and maintenance of *MPC* – the productive natural environment (category five in the hierarchy). Only recently have the results of this deviation begun to gain the attention it deserves[642].

Economic considerations[643] are an important part of the principle of *bal tashchit*. Nevertheless, they are lower in priority than other considerations such as human life, health, dignity and the productive environment that supports them[644].

7.2.3 – Theoretical application of the principle of *bal tashchit* to actual environmental problems

In the sixth chapter I theoretically applied the principle of *bal tashchit*, as developed in the previous chapters, to current environmental problems. I started with examining one environmental problem – the shortage of high quality fresh water (HQFW) in the land of Israel. I also explored, on a more peripheral level, how the principle of *bal tashchit* might be applied to two different types of environmental problems – climate change and loss of biodiversity.

This exercise demonstrated, in my opinion, the particular importance of the hierarchy for any practical application of the principle of *bal tashchit*. Using the hierarchy showed that there is sufficient HQFW in Israel for meeting the basic human needs expressed in categories 1 - 4. Israeli authorities successfully developed the water system to adequately supply HQFW to meet these needs. Protecting the *MPC* for HQFW – meaning protection of the natural system for collecting, storing, and supplying HQFW, as well as for purifying lower quality water (category 5) – was neglected in Israel, and this was done, largely, for meeting lower priority (category 6) needs and wants. In the meantime, the production of *NQU* (through education and research and development) in order to properly deal with the known challenges of the degradation of the natural water system and the water deficit, was also neglected. The making and implementation of water management decisions apparently lacked adherence to any sustainable principles. The remarkable progress that was made, was largely by trial and error, and at an unnecessary cost. In my opinion, many mistakes and a great deal of damage to the water system could have been avoided had there been adherence to the principle of *bal tashchit*.

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[642] See for example the discussion of category 5 in section 5.2.3 and section 6.2.6.5.

[643] While human life, health, dignity, etc. can be included in a very broad definition of 'economic considerations', I am limiting this term to a narrower definition of commonly marketed goods and services.

[644] This brings up an interesting problem for the developing world. While the model would justify temporarily degrading the productive (and renewable) natural environment in developing or undeveloped countries in order to meet basic human needs, it may not justify damaging the productive natural environment in order to export natural resources to developed countries to provide for their luxury consumption. The W.W.O.N. report (pp. 28-29), which was discussed in section 4.2.3, assigns some developing countries – particularly those with a high level of natural capital – with a very low, and sometimes even negative intangible capital (which roughly corresponds to what I am calling *NPC*). This is primarily because of their low investment in the first four categories of the hierarchy, particularly, category four – education and well-functioning government institutions (see section 5.2.3.4).

The theoretical application of the principle of *bal tashchit* to the problems of climate change and loss of biodiversity, though only peripheral, showed that adherence to such a principle could also have helped prevent these problems.

This exercise also demonstrated the importance of using, from the very beginning, a sustainable approach to the management of the environment. The principle of *bal tashchit* is one possible sustainable approach, which appears to be similar, in many ways, to other sustainable approaches to resource management (see section 4.1.1).

7.3 What can *bal tashchit* contribute to our current level of understanding and ability to manage our natural resources?

This thesis has described both the prohibition of bal tashchit and a principle of bal tashchit, based on the classical Jewish sources. Although based on some underlying assumptions that differ from modern-western thought (see appendix A), the principle of bal tashchit, as I have described it, bears many resemblances to current approaches to resource management in the western world. Certainly, the principle that nothing should be destroyed unless the benefits will be greater than the costs is common sense. Why, one could ask, do we need to take the 'detour' through the Jewish tradition to arrive at such an obvious conclusion? In my opinion, there are several contributions that the principle of bal tashchit, as I have described it in this thesis, can make, which I list as follows:

7.3.1 Development of a hierarchy of human needs which can contribute to a sustainable approach for allocating material resources

The hierarchy introduced in chapter five is, in my opinion, an essential, if implicit component of bal tashchit, that can be derived from the classic Jewish texts, and which can be helpful in understanding a 'religious' approach to environmental management. To my knowledge, there has been no previous discussion of this hierarchy. In addition, ensuring that the benefits from any destructive activity will be greater than the costs can be an arduous, if not impossible task that requires a satisfactory method for evaluating both the benefits and the costs. The hierarchy provides what I consider to be a sustainable approach for allocating material resources in a way that strives to maximize benefits and minimizes costs without the difficult and controversial requirement of putting a monetary figure on everything of value. This hierarchy also demonstrates how the principle of bal tashchit may differ from other approaches to the management of resources, which may prioritize differently.

7.3.2 A different perspective on man's relationship with the environment and environmental problems

In my opinion, the principle of *bal tashchit*, as part of the Jewish tradition, presents a different perspective on man's relationship with the environment, and with environmental problems than that commonly adapted in the western world. From this perspective, man is seen not as an 'outsider' or invader and menace to the natural environment, but rather as an integral part of the creation who not only benefits from the environment, but who can also benefit the environment. Through improving himself, in his role as an unequal partner with the environment, man helps improve the environment. On the other hand, 'environmental problems' are seen as a symptom of

lack of perfection, which has a negative role on the environment. This is expressed, in a more practical sense, in the hierarchy, particularly in the following two areas:

A. Increased emphasis on human dignity. As I discussed in chapter five (section 5.2.3.3), Jewish tradition places great importance on human dignity. One of the ways this is expressed is by maintaining a clear separation and elevation of humans above non-human forms of life. With the concurrent ascendancy of science and de-emphasis on religion, many in the Western world seem to be moving in the direction of minimizing the perceived differences between man and animals. From a Jewish perspective, as discussed in chapter five (section 5.2.3.3) this can be expected to have a negative effect on man, and on his relationship with his environment. As I discussed in section 5.2.3.3, dignity is closely related to the ability to produce benefits for others, and a higher level of human dignity may have a positive influence on the natural environment.

B. Increased emphasis on 'righteousness'. The principle of *bal tashchit*, as I have formulated it in this thesis, puts a great deal of emphasis on what I am calling 'righteousness', or 'proper' moral-ethical behavior; more so, it would seem, than other conventional approaches to environmental protection. While, in recent years, there has been a general increase in some types of moral-ethical behavior (such as more recycling, and what might be called 'acting green'), it could be argued that the overall emphasis on, and the level of what was traditionally considered acceptable moral-ethical behavior has declined in western societies. This overall decline can be expected, according to the principle of *bal tashchit*, to have a negative effect on man and his relationship with the environment.

7.3.3 An approach towards understanding the remarkable debate between those who believe that man is rapidly destroying his environment/life-support system and those who disagree.

As the human population and consumption levels increase throughout much of the world, there is an important and still unresolved debate between those who believe that we are destroying the environment and those who believe that the situation for man and his environment is still manageable, if not improving. The crux of the argument, in my opinion, is whether or not man can meet the challenges of managing environmental problems through innovation and behavioral changes[645]. In my opinion, the principle of *bal tashchit* can provide a useful approach for better understanding and perhaps, helping to resolve, this debate, as discussed in Appendix C.

7.3.4 A principled approach to environmental management for the general 'religious' public, particularly those of the 'Abrahamic' faiths

The principle of *bal tashchit* may be of particular interest to the 'religious' public. Aside from Jews, much of the world's population follows 'Abrahamic' religious beliefs (Christianity and Islam) that attribute Divine authority to the Torah, or Hebrew Bible. In addition to Jewish scholars[646], a number of non-Jewish scholars such as Jan Boersema and Aloys Hütterman have

[645] It is important to note that I am excluding making sacrifices in human population numbers and quality of life from what I am calling 'behavioral changes'.

[646] Examples include: Manfred Gerstenfeld, *Judaism, Environmentalism and the Environment*, (Jerusalem, 1998), Nachum Rackover, *Ichut Hasviva*, Sifriat Hamishpot Ha'ivri, (Jerusalem, 1993), Meir Zikel *Ichut Hasviva (Ekologia)*

recognized the importance of some of the 'ecological principles' in the Torah, as described at the beginning of this thesis. In this context, the principle of *bal tashchit* can be presented as a sustainability principle, based on Abrahamic faith, that can now be better understood and utilized.

7.3.5 A Torah-based sustainability principle for Torah-observant Jews

Evidence suggests that Torah-observant Jews, while generally familiar with the prohibition of *bal tashchit*, are not familiar with the ecological ramifications of *bal tashchit* as a wider principle[647]. This population tends to be wary of, and to 'lag behind' new movements such as the sustainability movement, while, at the same time, this population is rapidly increasing its numbers and material consumption levels[648], and therefore, its potential negative environmental impact. The principle of *bal tashchit*, as I have described it, may help this population to reduce any negative environmental impact of their rapidly growing population and material outlook.

7.4 Concluding Observations

From a historic perspective (as I discussed in chapter three), the principle of *bal tashchit* seems to be situation-dependent, waxing or waning in importance relative to the availability of material resources and the care in which they are managed[649]. From this perspective, the principle of *bal tashchit* is especially relevant today, in the modern world, where material resources are abundant and affordable for much of the world's population, and where evidence would suggest that neither they, nor the environment in which they are found, are being managed in an optimal way.

The principle of *bal tashchit* is built on the progress and development of man – the human population – as symbolized, in the Jewish tradition, by the fruit-producing tree of Deuteronomy 20:19-20. This progress and development aims to transform man's primary orientation from being a consumer to being a producer of benefits. Without a strong emphasis on the progress and development of the human population, by investing surplus *MQU* into *NPC* (such as through increasing education, and research and development), I am doubtful that this, or any other approach can succeed in improving the situation of man or his environment. In any case, without focusing on human development, I am forced to concede that a society may be better off with other (non utilitarian) approaches to managing their natural resources. It is doubtful, in my opinion, that a 'utilitarian' approach to resource management could be sustainable if surplus resources are heavily used for other human purposes (such as luxury, entertainment, etc.) instead of being invested into increasing humanity's intellectual and moral-ethical development (*NPC*).
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B'mekorot Ha'yahadut, (Tel Aviv, 1990), and Aryeh Carmell, 'Judaism and the quality of the environment', in *Challenge*, 2nd Edition, Feldheim, (Jerusalem, 1976).

[647] For example, as I wrote about in the first chapter, none of the three books recently published by and for people in the Torah-observant world approach *bal tashchit* as a wider principle for addressing even localized environmental problems.

[648] See for example: Yosseph Shilhav and Moti Kaplan, *Haredi Community and Environmental Quality*, (Jerusalem, 2003), which describes the haredi (fervently orthodox) community in Israel and its attitudes towards the environment. The haredi community is the most rapidly growing sector in the Jewish population, both in Israel and abroad.

[649] Chapter three (section 3.1.6) describes earlier precedents for the increased emphasis on the prohibition of *bal tashchit* – particularly its moral-ethical aspects – during periods of relative material abundance.

7.4.1 Relying on human innovation and progress to address current problems.

Albert Einstein is quoted as saying[650]: *The significant problems we face cannot be solved by the level of thinking that created them*. An important assumption of the principle of *bal tashchit*, as I have described it, is that the level of thinking (which is part of what I am calling *NQU*) will continue to increase in the future. The level of scientific knowledge in the developed world has been increasing at an accelerating rate for most of the past two centuries and there is good reason to believe that it will continue to increase as both the human population and levels of education increase. It is this increasing *NQU*, some suggest[651], that will enable man to confront the formidable challenges he faces – for example, shortages of HQFW and climate change – and emerge in a better situation, overall, than he was in before facing the challenges.

The reliance on breakthroughs in knowledge to address current challenges is already well-established in the modern western world. For example, the "Manhattan Project" in the early 1940's provided the United States with a working atomic weapon before the end of the Second World War, and helped facilitate the beneficial uses for atomic energy that followed – all of which represented a tremendous advancement in knowledge. The 'Green Revolution[652]' between the 1950's and the 1970's enabled India and other developing countries to feed their growing populations – in spite of the dire predictions of some that the situation was already hopeless[653]. More recently, one could argue that ambitious environmental protection goals in the U.S. and Western Europe over the past forty years spurred the development of pollution-abatement knowledge and technologies that have led to improvements in environmental quality in those and other regions[654]. Also, as we have seen, Israel has made significant (though not yet sufficient) progress in water management through the contribution of her growing and increasingly educated population and the *NQU* they produce.

Recent experience shows that the consumption of vital resources such as HQFW can be curbed in developed countries with high standards of living and high material throughput, without harming economic and other interests. The key is always the development and proper application of *NQU*. For example, Gleick writes[655]: *What explains this remarkable turn of events [decrease in demand for HQFW in some developed countries]? Two factors: people have figured out how to use water more efficiently, and communities are rethinking their priorities for water use. Throughout the first three quarters of the 20th century, the quantity of freshwater consumed per person doubled on the average; in the U.S., water withdrawals increased 10-fold while the population quadrupled. But since 1980 the amount of water consumed per person has actually decreased, thanks to a range of new technologies that help to conserve water in homes and industry. In 1965, for instance, Japan used approximately 13 million gallons of water to produce $1 million of commercial output; by 1989 this had dropped to 3.5 million gallons (even counting for inflation) – almost a quadrupling of water productivity. In the U.S., water withdrawals have fallen by more than 20 percent from their peak in 1980.*

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[650] See http://www.quoteworld.org/quotes/4150.
[651] For example, this is a central thesis of Julian Simon in his book *The Ultimate Resource* (Princeton, 1986).
[652] For a description of the 'Green Revolution', see chapter four (section 4.4., footnote 103).
[653] See Appendix C for discussion on the controversy between the 'neo-Malthusians' who predicted massive starvation in India and other parts of the world and their opponents.
[654] Examples include significant reductions in sulfate emissions in the U.S. and Western Europe as well as improvements in the water quality of the Boston Harbor in the U.S. and the Thames river in England.
[655] Peter H. Gleick, "Making every drop count", *Scientific American*, (February, 2001), pp.29-33.

According to Hawken *et al.*[656]: *95 percent reductions in material and energy [usage] are possible in developed nations without diminishing the quantity or quality of the services that people want*. These reductions are possible because of increasing *NQU*, which is in effect substituting for much of the *MQU* previously required to provide the services. Hawken *et al*. provide a number of illustrations of what they call "substituting quality and innovation for mass"[657]. For example: *In the United States, aluminum cans weigh 40 percent less that they did a decade ago; Anheuser-Busch just saved 21 million pounds of metal a year by making its beer-can rims an eighth of an inch smaller in diameter without reducing the contents. A new Dow process that eliminates varnishing, spraying, and baking can save 99.7 percent of the wasted material and 62 percent of the energy needed for preparing aluminum beverage cans for filling.* The same authors even claim that innovation can transcend some of the physical laws – as currently understood, writing[658]: *Each time practical limits to innovation seem to be approaching, or even limits imposed by the laws of physics, someone devises a way to evade those limits by redefining the problem. Generations of power engineers knew that their generating plants couldn't ever be more efficient than 40-odd percent efficient because of Carnot's Law, which first described the theoretical limits. Surprise: Now you can buy off-the-railcar combined cycle gas turbines that are about 60 percent efficient, using a hotter thermodynamic cycle.*

The proper production and application of *NQU* is a key element in dealing with resource management problems. Increasing knowledge as well as modifying human behavior enables man to better address these challenges. As Jesse Ausubel writes[659]: *Giving up on science [*which I consider a form of *NPC* for producing secular knowledge*] is probably the biggest threat to modern civilization. It's not something that would happen overnight. But if we stop the R&D enterprise, and stop getting better at what we do in farming or transport or scores of other occupations, then after 20 or 30 or 50 years the chances for human misery, and for destruction of the environment, would be huge.*

Along these lines, the M.A. report finds that two of the barriers to the sustainable management of ecosystems are[660]: *Underinvestment in the development and diffusion of technologies that could increase the efficiency of use of ecosystem services and could reduce the harmful impacts of various drivers of ecosystem change, and insufficient knowledge (as well as the poor use of existing knowledge) concerning ecosystem services and management, policy, technological, behavioral, and institutional responses that could enhance benefits from these services while conserving resources.*

Similarly, Carpenter *et al*. write[661]: *People have enormous capacity to adapt. Thus, investments in education and technology have substantial implications for future ecosystem services. However, we have limited capacity to project the effects on ecosystem services of investments in education or development of green technology*.

It is clear that the world could not support today's population, at today's standards of living, with the level of knowledge man had 100 years ago – even though the available matter and energy

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[656] Paul Hawken, Amory Lovins and L. Hunter Lovins, *Natural Capitalism*, (New York, 1999), p.176
[657] Ibid. p.76.
[658] Ibid. p.66.
[659] Jesse Ausubel, "Be green, think big", interviewed by Fred Pearce, *New Scientist*, issue 2536, (28 January 2006), p.46.
[660] Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*. Island Press, Washington D.C., World Resources Institute, 2005, p.20.
[661] Stephen R. Carpenter, Ruth DeFries, Thomas Dietz, Harold A Mooney, Stephen Polasky, Water V. Reid, Robert J. Scholes, "Millenium Ecosystem Assessment: Research Needs", *Science*, vol. 314, (2006), p.258.

making up material resources is basically the same. By the same token, it seems reasonable to say that in another 50 years the world will be able to support a larger, or at least, wealthier population than it can today – as long as knowledge (*NQU*) keeps increasing. Increasing *NQU* can continue to provide more *MQU* for man from the same basic matter and energy.

All of this is predicated on the investment of sufficient resources into education and research and development – something many countries, particularly developing countries, are not willing or able to do on their own. For example, the 'Green Revolution' was largely enabled by research & development and educational efforts originating in wealthier developed countries. In the words of economist Geerat Vermeij[662]: *Even in today's establishment of organized research, great breakthroughs depend on the talents of a few individuals. The pool of highly talented scientists, inventors, and entrepreneurs clever enough to solve the most intractable problems and with enough savvy to bring the solutions into the marketplace is likely to be proportional to the overall size of the population. This is the crux of the argument by Julian Simon and other economists in favor of an increase in the human population as the best way to innovate ourselves out of our collective predicaments. In order for population growth to have this effect, however, everyone must be afforded the educational and employment opportunities to realize their intellectual or entrepreneurial potential. This means that population growth must be closely linked either to an abundance of resources and to a permissive attitude toward innovation in society, or to an increase in resources and social mobility. Growth in the number of individuals by itself is neither sufficient nor even necessary; it must be accompanied or replaced by per capita economic growth, by individual liberty, and by inclusive participation in the discovery and implementation of solutions and social goals. It is no accident that Greece, with perhaps the earliest version of democratic government in some of its city-states, produced a disproportionately large number of extraordinary thinkers despite a small population*.

7.4.2 The developed world and the developing world

Many of the most serious resource management and environmental problems are taking place in the developing world. The most dangerous phase with resource management seems to be the rapid development stage, (stage 2 as described in section 4.5) where societies are consuming and degrading great quantities of *MQU* without commensurate production of *NQU*. This is today illustrated by China and India, which are currently experiencing some of the world's worst environmental problems. Hopefully, these countries will soon progress to stage three where the increased production and availability of *NQU* will replace much of the *MQU*, allowing for a more sustainable increase in the quality of life.

Many vital resources are unequally distributed in the world. Some countries have a surplus and others have shortages. *NPC* is also distributed unequally in the world. Often *NPC* is strong where *MPC* is weak, and vice-versa, suggesting great opportunity for mutually-beneficial exchange. For example, many developed countries are in a 'post-industrial' stage, focusing on the production of *NQU* to find better and more efficient ways of using resources and improved environmental technologies for renewable energy and water conservation. This *NQU* can be exported to developing countries – sometimes in exchange for *MQU*. Indeed, this is already happening. One current example is the mutually beneficial exchanges of *NQU* (in the form of advanced

[662] Geerat J. Vermeij, *Nature; an Economic History*, (Princeton, 2004), pp. 306-307. Note: this quote also appears in Appendix A.

knowledge for more efficient agricultural and industrial production) from Israel for *MQU* from Turkey (in the form of 'virtual water' with the importation of agricultural and industrial products).

In much of the developed world – having made important gains in 'old' environmental problems such air and water pollution – the focus is on 'new' problems such as climate change. There is, in my opinion, good reason to predict that, with sufficient investment in *NPC*, man will learn to successfully manage the 'new' problems as well. The likelihood is that we will also be faced with other, new problems in the future - some that may appear even more daunting than the problems we currently face. This is, of course, the story of human history and human progress.

A great deal of the resources consumed in developed countries are for non-essential (category 6) type activities. Per capita consumption of most basic resources in these countries is way beyond the subsistence level. At the same time many people in other parts of the world don't have enough *MQU* to satisfy their basic needs. To the extent that the surplus consumption of *MQU* in developed countries can be replaced with *NQU* (as described in chapter 5), and both the surplus *MQU* as well as the *NQU* produced in the developed countries is shared with those less fortunate, the entire world can benefit.

7.4.3 Increasing *NQU* in the form of 'righteousness'

While the knowledge side of *NQU* has rapidly increased – particularly in the developed world – the 'righteousness' side of *NQU* remains largely underdeveloped. There is, in my opinion, great potential and a great need for increasing the level of 'righteousness', as I have defined it (see chapter four, section 4.2.3), particularly in the developed world. R. Carmell writes[663]: *There is only one way to avert the [ecological] disaster which threatens to overwhelm mankind. Material goals must be replaced by spiritual goals… This would be… no less than a Copernican revolution of the mind, and which would show mankind at last how to substitute spiritual goals for material goals… spiritual growth does not create pollution. On the contrary, it minimizes it… When spiritual growth becomes the goal, the overproduction due to artificially-boosted consumer needs will automatically be phased out. Industry will be geared to satisfying the real needs of all mankind, instead of the illusory needs of the affluent few.*

The pursuit of 'spiritual goals' that R. Carmell writes about is consonant with what I am calling 'righteousness'. Righteousness is a very important part of the principle of *bal tashchit*, as I have described it. In fact, without righteousness, the principle may not work[664]. Increasing righteousness in human societies is always a challenge. Historically, this was considered to be within the scope of religious education and observance. Today, especially where religious education and observance have declined, righteousness may need to be imparted in other ways.

From a Jewish perspective, when man produces *NQU* (for example, through research and development into renewable energy or other environmental technologies), in order to find better ways to use the Creator's world, and when he shares this knowledge with others (for example through education), and when man restrains himself from needlessly degrading resources, he is doing the will of the Creator, and fulfilling a religious duty. This can be compared to engaging in medical research to find better ways to cure disease and protect health, which is also considered a

[663] Carmell (1976), pp 518-520.
[664] The principle of *bal tashchit* requires responsibility and self-discipline, both of which are characteristics of how I define righteousness in chapter four (section 4.2.3).

religious duty[665]. These types of research (medical and 'ecological'), can enable man to better serve the Creator. The production of *NQU* is the essential difference between the world as it existed in the past – with a carrying capacity of less than a billion people, and how it exists today – with a human population of 6.5 billion and climbing, living longer, healthier, and arguably more productive lives than in the past.

7.5 Recommendations for further research

Based on the findings of this thesis, I can identify the following areas for future research[666]:

7.5.1 Comparing the hierarchy for resource management with priorities in other societies.

Comparing the hierarchy presented in this thesis with the de facto priorities for resource management in other societies – while beyond the scope of this thesis – would be, in my opinion, a worthy resource project. I would expect such a study to reveal differences in priorities according to each society's stage of development (see section 4.3). Those societies in the highest stages of development would be expected to bear the closest resemblance to the hierarchy described in chapter five. That is to say, more-developed societies (in the third stage of development) would be expected to put a higher priority on human life, health, education, and protecting ecosystem services than societies in stages one and two. Nevertheless, I would expect the hierarchy described in chapter five to diverge from the implicit priorities in even stage three societies in the greater importance that it places on categories three (human dignity), four (religious duties – primarily education, and more particularly, moral-ethical education) as well as category five (protection of ecosystem services). These categories focus on building and protecting NPC and MPC (increasing the human and the natural environment's capacity to produce benefit for man). I would expect the greatest contrast when the hierarchy is compared with the priorities of developing countries, especially those with relatively abundant natural resources and low investment in human capital.

It would also be interesting to compare the hierarchy with other approaches to resource management. Using the four approaches to resource management described in chapter four (section 4.1.1) as a frame of reference, I would expect that the *exploitive* approach would put economic return (category six in the hierarchy) ahead of protecting *MPC* (category five in the hierarchy). At the other extreme, the *preservation* approach might move protecting *MPC* up several places, closer to the highest priority. The *utilitarian* approach might look very similar to our hierarchy, with perhaps slightly less emphasis on protecting *MPC*, and the *ecosystem* or *sustainable* approach might give slightly more emphasis to protecting *MPC* than our hierarchy. The question would be on how much emphasis different societies would give to categories three and four (human dignity, and religious duties, including education). All of these approaches seem to put less emphasis on *NPC* and *NQU* – on man as a producer of benefits – than the principle of *bal tashchit*.

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[665] For example, Maimonides writes (Hilchot De'ot, 4:1-2): *Having a healthy and complete body is part of going in the ways of God – for it is impossible for one to know or understand [anything of God's wisdom] when one is ill – therefore, one must keep away from things which destroy the body.* Discovering those things which destroy or harm the body and how to avoid them can therefore be considered a religious duty.

[666] These recommendations are in addition to the recommendations for further research listed in chapter 6, which were related to addressing specific environmental problems.

7.5.2 Developing a methodology for quantifying what I am calling *MQU* and *NQU*, and for assessing tradeoffs between *MQU* and *NQU*

NQU plays a critical role in the principle of *bal tashchit*. An important objective of the principle of *bal tashchit* is the substitution of *NQU* for *MQU* (see chapter five, section 5.1.2). Producing *NQU* requires an investment of *MQU*, and sometimes, perhaps, even an investment of *MPC*. It would be very useful to have a reasonable way of quantifying *MQU* and *NQU*, and determining even a crude 'conversion rate' between them. This would help in estimating how much *MQU* or even *MPC* might be justified to sacrifice for a unit of *NQU*.

7.5.3 Developing better ways for increasing 'righteousness'

As discussed above, what I am calling 'righteousness[667]' plays a very important role in the principle of *bal tashchit*. A higher level of righteousness is required, in my opinion, for the human population to achieve a high quality of life in a sustainable way. How to teach, or otherwise increase righteousness in modern societies is a considerable challenge. Nevertheless, it is of such importance that it cannot be brushed aside or replaced by any other solutions.

[667] 'Righteousness' was defined in the fourth chapter as including the character traits of modesty, humility, honesty, self-discipline, balance, appreciation, consideration and responsibility.

7.6 Closure

I will close with the words of the prophet Ezekiel, who foresees a time when the Temple in Jerusalem will be the conduit for what might be called *QU* – symbolically carried by water[668] flowing from the Temple – to irrigate the productive natural environment and bring wisdom and other benefit to all of humanity. These verses utilize all of the symbolic elements I have associated with the principle of *bal tashchit*: man, trees and fruits, as well as water[669]:

> *And He took me to the entrance of the House [Temple], and behold, water was coming forth from beneath the eastern threshold of the House... and He took me round to the outer gate, the way which turns to the east, and water was trickling from the right-hand side... A mighty flood [was coming out of the Temple]. He said to me: these waters are going out... to the desert plain, and they will reach the sea - the polluted waters of the sea - and the waters will be healed. All the living things that swarm there - As soon as these streams reach them they will live; however many they may be. For when these waters reach there they will be healed and they will live; Wheresoever the stream comes... And by the stream there shall spring up, on its banks, upon each side, all manner of fruit trees, whose leaves shall not wither neither shall their fruit cease; it will ripen anew month by month; for its waters come forth from the sanctuary. Its fruit shall be for food and its leaves shall be for healing.*

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[668] There are many sources for the use of 'water' as a symbol for Torah in the Jewish tradition. See for example B.T. Baba Kamma 17a and 82a; Avodah Zarah 5b: אין מים אלא תורה.

[669] Ezekiel 47:1-13:

וישבני אל פתח הבית והנה מים יצאים מתחת מפתן הבית קדימה כי פני הבית קדים והמים ירדים מתחת מכתף הבית הימנית מנגב למזבח. וצאני דרך שער צפונה ויסבני דרך חוץ אל שער החוץ דרך הפונה קדים והנה מים מפכים מן הכתף הימנית. בצאת האיש קדים וקו בידו וימד אלף באמה ויעברני במים מי אפסים. וימד אלף ויעברני במים מים ברכים וימד אלף ויעברני מי מתנים. וימד אלף נחל אשר לא אוכל לעבר כי גאו המים מי שחו נחל אשר לא יעבר. ויאמר אלי הראית בן אדם ויולכני וישבני שפת הנחל. בשובני והנה אל שפת הנחל עץ רב מאד מזה ומזה. ויאמר אלי המים האלה יוצאים אל הגלילה הקדמונה וירדו על הערבה ובאו הימה אל הימה המוצאים ונרפו המים. והיה כל נפש חיה אשר ישרץ אל כל אשר יבוא שם נחלים יחיה והיה הדגה רבה מאד כי באו שמה המים האלה וירפאו וחי כל אשר יבוא שמה הנחל. והיה עמדו עליו דוגים מעין גדי ועד עין עגלים משטוח לחרמים יהיו למינה תהיה דגתם כדגת הים הגדול רבה מאד. בצאתיו וגבאיו ולא ירפאו למלח נתנו. ועל הנחל יעלה על שפתו מזה ומזה כל עץ מאכל לא יבול עלהו ולא יתם פריו לחדשיו יבכר כי מימיו מן המקדש המה יוצאים והיה פריו למאכל ועלהו לתרופה. (יחזקאל מז:א'-י"ג)

Appendix A – Underlying Assumptions (beliefs and principles) of the principle of *bal tashchit*

As discussed in the first chapter, one of the challenges in defining and describing a modern principle of *bal tashchit* is the difficulty of bridging the gaps between different systems of thought. The principle of *bal tashchit* is part of a Jewish tradition which contains underlying assumptions about man and the world around him that are quite different from predominant contemporary western attitudes. An understanding and agreement with these underlying assumptions may not be a prerequisite for the practical application of *bal tashchit*, but it does add to our understanding of the principle. This appendix attempts to clarify the underlying assumptions upon which the principle of *bal taschit* rests.

R. Vorhand, in the introduction of his description of *bal tashchit*, lists the following three underlying principles for the prohibition of *bal tashchit*[670]:

1. The Creator is concerned about [protecting the material resources in] His creation [and therefore commanded man to use them carefully]

2. Humans must learn to control their destructive impulses

3. Recognition and appreciation of the good the Creator provides:

According to the first principle, the main concern of the prohibition of *bal tashchit* is the conservation of resources. Humans are commanded by the Creator to use the resources properly so as not to waste or needlessly destroy them.

The second priniciple focuses on human behavior, independent of the welfare of material resources. Human character development requires learning to control destructive impulses

The third principle, like the second one, focuses on human behavior rather than on the resources themselves. This principle is based on the idea that one who recognizes and appreciates material resources as gifts from the Creator will be less likely to waste or needlessly destroy them.

Vorhand is clearly writing for a Torah-observant audience, and assumes the prior acceptance of other underlying assumptions, such as the existence of a Creator, which he sees no need to mention. For a wider audience, I can make use of Boersema's 'thematic framework' of the Hebrew Bible, which lists some of the implications of the fact that the world is viewed in the Hebrew Bible as God's creation[671]:

1. The Creation was originally good and untarnished.

2. The God of creation is the God of history, here to be taken as denoting a progressive history rather than one of cyclic repetition.

3. The creation narrative implies a radical break with the polytheism and nature worship practiced by neighboring peoples and within Israel itself.

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[670] Vorhand, pp.12-17.
[671] Boersema, pp.35-38.

Partially drawing on these two lists, I can delineate what I consider to be necessary underlying assumptions for properly understanding the principle of *bal tashchit* as I have described it in this thesis:

1. **There is a Creator, who created the world *ex nihilo*.**

This is the first and most basic of the underlying beliefs and principles upon which *bal tashchit* is based, and the beginning of the Hebrew Bible[672]:

בְּרֵאשִׁית בָּרָא אֱלֹקִים אֵת הַשָּׁמַיִם וְאֵת הָאָרֶץ וְהָאָרֶץ הָיְתָה תֹהוּ וָבֹהוּ ... (בראשית א:א-ב)

> *In the beginning G-d created the heaven and the earth. And the earth was without form and void…*

Maimonides writes at the beginning of his *Laws of the Foundations of the Torah*[673]:

יסוד היסודות ועמוד החכמות לידע שיש שם מצוי ראשון , והוא ממציא כל נמצא , וכל הנמצאים משמים וארץ ומה שביניהם לא נמצאו אלא מאמתת המצאו. (רמב"ם הלכות יסודי התורה א:א)

> *The foundation of foundations and the pillar of all wisdom is to know that there is a first Existence, and He brings into existence everything [else] that exists. And everything that exists in the heavens and the earth and that which is between them only exists from the fact of His existence.*

From this principle, it follows that everything in the world belongs to the Creator, and is ultimately subject to the will of the Creator. Man is, at most, only a caretaker for the Creator's possessions.

2. **Man was created in the image of the Creator, and was given special rights and responsibilities vis à vis the Creator's world**

This is expressed in the following Biblical passages[674]:

וַיִּבְרָא אֱלֹקִים אֶת הָאָדָם בְּצַלְמוֹ בְּצֶלֶם אֱלֹקִים בָּרָא אתוֹ זָכָר וּנְקֵבָה בָּרָא אתָם: וַיְבָרֶךְ אתָם אֱלֹקִים וַיֹּאמֶר לָהֶם אֱלֹקִים פְּרוּ וּרְבוּ וּמִלְאוּ אֶת הָאָרֶץ וְכִבְשֻׁהָ וּרְדוּ בִּדְגַת הַיָּם וּבְעוֹף הַשָּׁמַיִם וּבְכָל חַיָּה הָרמֶשֶׂת עַל הָאָרֶץ. (בראשית א:כ"ז-כ"ח)

> *So God created mankind in his own image, in the image of God He created him; male and female he created them. And God blessed them [Adam and Eve] and said to them: Be fruitful and multiply and replenish the earth and subdue it and have dominion over the fish of the seas and over the birds of the air and over every living thing that moves on the earth*

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[672] Genesis 1:1.
[673] Maimonides, *Mishneh Torah*, ed. S. Frankel (Jerusalem and B'nei Braq, 1998), Laws of the Foundations of the Torah, Chapter 1, Halacha 1.
[674] Genesis 1:27-28.

It is evident from the first two underlying assumptions that Judaism is *theocentric* rather than anthropocentric. Everything, including man, was created by and belongs to the Creator. Within this theocentric approach, man – by virtue of being created in the image of the Creator – is given a special and elevated status, including a limited mastery over the earth. Everything on the earth exists for man's potential *benefit* (see section 3.2.2.4), but – and this is a very important point – not necessarily *only for the sake of* man. The rest of creation can also (potentially at least) benefit from man. In fact, according to Jewish tradition, man is also obligated to provide at least some benefit for the world, as indicated by the following verse[675]:

ויקח ה' אלוקים את האדם ויניחהו בגן עדן לעבדה ולשמרה (בראשית ב:ט"ו)

> *And the Lord God took the man, and put him into the garden of Eden to till it and to keep [protect] it.*

This verse expresses the responsibility given to man towards his primordial environment – which according to Jewish tradition, was the Garden of Eden. According to the commentary of R. Hirsch on this verse[676]:

> *It is deeply significant that the activity of man mastering the earth is called עבודה (service). עבד (related to אבד) is being completely engulfed in the purposes of someone else. At man's mastery over the earth he himself is directly in the service of God, but indirectly in the service of the earth although G-d has made him master of its uses… The mastery of a true Adam [man] over the earth is really in truth עבודת האדמה, "serving it", furthering its true purpose.*

R. Hirsch also stresses the unity of the created universe and the mutuality of benefit between all the parts in the following poetic passages[677]:

> *He [the Creator], in His infinite wisdom, ordained this mutual interdependence in order that each individual being might contribute, whether much or little, to the preservation of the All. Thus water, having penetrated the earth, is collected in cloud and sea; light, having pierced the earthy crust and brought forth plants, is concentrated again into sun, moon and stars; the germ, the offspring of earth, is taken from the soil and given to the crown of ripened fruition so that the earth may produce again. One glorious chain of love, of giving and receiving, unites all living things. All things exist in continuous reciprocal activity – one for All, All for one. None has power, or means, for itself; each receives only in order to give, and gives in order to receive, and finds therein the fulfillment of the purpose of its existence. "Ha-Shem" – "Love," say the Sages, "love which supports and is supported in turn" – that is the character of the Universe.*

As a continuation of the theme of the previous passage, R. Hirsch singles out the role of man in the unified universe in the following words[678]:

> *Since all things, the smallest and the greatest alike, are God's chosen messengers, should man alone be excluded from this sphere of blessed activity? Can it be that he is born only to take? Born not to fill any place, nor to fulfill any purpose but to let all things end in*

[675] Genesis 2:15.
[676] R. Samson Raphael Hirsch, *The Pentateuch*, vol. 1, pp.52-53 (on Gen. 2:15).
[677] R. Samson Raphael Hirsch, *The Nineteen Letters on Judaism*, ed. Jacob Breuer (Jerusalem, 1969), p.36.
[678] Ibid. p.37.

> *him? No! Your own conscience says it, even as the Torah proclaims; man is to be Tzelem Elokim, "an image of God." You are called not merely to enjoy or suffer. Spirit, body, wealth, every ability and every power, all constitute means of activity. They were given le-ovda ul-shomroh, to promote and preserve the world – in love and righteousness. The earth is not yours, but you were given to the earth, to respect it as Divine soil and to deem each one of its creatures a creature of God, your fellow-being.*

In Jewish tradition, man is not given free reign to do anything he pleases with the world. The prohibition of *bal tashchit* is but one of many examples of the limitations the Torah places on man's rights of usage of the world around him. Another prominent example is the Sabbath, which severely restricts the rights of Jews to utilize the natural world one day out of every seven. In the words of R. Hirsch[679]:

> *The perception of man within the context of nature is reflected, too, in the festivals which Judaism teaches its young to celebrate along with their elders. Take the Sabbath, that age-old symbol of creation which is known to all mankind and which the Jew observes by refraining from every creative act designed to master the physical world for man's own purposes. By keeping the Sabbath in this manner, the Jew, in a weekly act of homage, places his world-dominating human energies at the feet of God, thereby acknowledging Him as the true Master and Creator of the universe.*

3. **The world was created for the benefit of man[680]. One of the functions of the natural world is to provide man with the means to satisfy his needs. Towards this, man is permitted to utilize, and if necessary, damage or destroy material resources in order to satisfy his needs, within certain limits. Nevertheless, man is not permitted to *needlessly*[681] damage or destroy any of the Creator's world.**

This principle is illustrated by the *Midrash* from *Kohelet* (Ecclesiastes) *Rabba*[682] (which was introduced in section 2.2.1):

בשעה שברא הקב"ה את אדם הראשון נטלו והחזירו על כל אילני גן עדן ואמר לו ראה מעשי כמה נאים ומשובחין הן וכל מה שבראתי בשבילך בראתי, תן דעתך שלא תקלקל ותחריב את עולמי, שאם קלקלת אין מי שיתקן אחריך. (קהלת רבה (וילנא) פרשה ז)

> *When The Creator created the first man he took him and showed him all the trees of the Garden of Eden and said to him "See my works, how beautiful and praiseworthy they are. And everything that I created, I created it for you. Be careful not to spoil or destroy my world – for if you do, there will be nobody after you to repair it. (emphasis added)*

Whereas it is prohibited to *needlessly* damage or destroy fruit-producing trees and other resources, it is permitted to damage or destroy them in order to satisfy (some) human needs. Not all resources, and not all needs are equal. Resources that produce a stream of services or

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679 R. Samson Raphael Hirsch, "The Educational Value of Judaism", in *Collected Writings of Rabbi Samson Raphael Hirsch*, vol. VII (Jerusalem, 1986), p.256.

680 See section 3.2.2.4 for a more detailed discussion of this point in the Jewish tradition.

681 I have defined 'needless' as where the costs exceed the benefits so that there is a net loss to the welfare of man and the world (see section 3.5).

682 *Ecclesiastes Rabbah* (Vilna, 1878), vol. 2, sect.7:13, p.39.

other benefits to man (for example, fruit-producing trees) are given priority over other resources that provide less benefits, or that only provide immediate, one-time benefit. This is illustrated in the following midrash:

"ועשית את הקרשים למשכן עצי שטים עומדים ". למה עצי שטים ? למד הקב"ה דרך ארץ לדורות , שאם יבקש אדם לבנות ביתו מאילן עושה פירות אומר לו ומה ממה "מ שהכל שלו כשאמר לעשות משכן אמר לא תביא אלא מאילן שאינו עושה פירות אתם עאכ"ו. (שמות רבה (וילנא) פרשה לה)

> *"And you shall make the boards for the tabernacle from acacia wood"*[683]*. Why from acacia wood? The Creator is teaching proper conduct for the generations. If a person wants to build his house from the wood of a fruit-producing tree, say to him: Just as the King of Kings, to whom everything belongs, said to build the tabernacle [His 'House'] only out of wood from trees that don't bear fruit, all the more so should you [only build with wood from non fruit-producing trees]*[684].

Needlessly damaging or destroying any of the Creator's resources is considered to be an offence against the Creator[685]. In the words of contemporary Torah scholar R.Yitzchak Zilberstein[686]:

דאיסור השחתת עץ ואיסור בל תשחית בכלל אינו משום מזיק , דמזיק הוא איסור מיוחד לעצמו ... משא"כ איסור בל תשחית הוא איסור בכלל שלו להשחית בעולמו של הקב "ה חינם על לא דבר ... דהיינו שכל ההדגשה בבל תשחית הוא שלילת כל השחתה ואבדון שבעולם ואינו נוגע אם הוא חפץ שלו או של אחר או של הפקר.

> *The prohibition of destroying a [fruit-producing] tree and the prohibition of bal tashchit in general is not because of torts – for Jewish law contains a separate category for torts. Bal tashchit is the* general prohibition against unnecessarily destroying any of the Creator's world *... All of the emphasis in bal tashchit is on the* negation of any [needless] destruction or loss in the world*, and it makes no difference whether the object belongs to him [the destroyer] or to another or is ownerless* (emphasis added).

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[683] Exodus 26:15.
[684] Exodus Rabbah 35:2 (on Exod. 26:15), vol. 3, p. 388.
[685] For example, R. Hirsch writes (*Horeb*, Chapter 56, p. 280): *However, if you use them [resources] unwisely, be it the greatest or the smallest, you commit treachery against My world, you commit murder and robbery against My property, you sin against Me!…*.
[686] Zilberstein,'Observations on *Bal Tashchit*,' *Zohar: Kovetz Torani*, (1988), p.75.

4. **There is a plan and a purpose for the Creation. The Creator wants His creation – man and the world around him – to progress towards the fulfillment of this plan[687]. The Creator provides man with the resources he needs to achieve this aim – including the natural world around him. When man uses the world's resources according to their created purpose, he contributes to this progress. When resources are misused – wasted or needlessly destroyed – it violates the will of the Creator and leads to degradation rather than progress.**

For example, R. Yaakov Zvi Mecklenburg (1785-1855) writes[688]:

וטעם האיסור, שאין ראוי לשמש בדבר מן הנבראים אל הפך המכוון ממנו בבריאה ... כן עץ המכוון בבריאתו לעשות פירות למאכל בני אדם להחיותם, אין לעשות בו דבר המשחית את האדם ומאבדו.

> *The reason for the prohibition [of destroying food producing trees] is because it is not fitting to use something for the opposite of its created purpose… [Food-producing] trees, which were created to produce fruits and provide sustenance for humans, should not be used for any purpose that causes destruction to humans.*

This principle focuses on the progressive improvement of the created world. There is also a related principle known as[689] מעלין בקודש ולא מורידים בקודש, meaning we always strive to increase in the level of holiness and to prevent a decrease in the level of holiness. Holiness – while a difficult concept to define – can be described as using everything for the proper purpose, for which it was created. In the words of R. Simcha Wasserman (1902-1992)[690]: "*Holiness comes when we live properly with nature. This means that we have to search for the proper purpose for everything we have and to use it for that purpose. When we use everything we are given for the purpose for which it was given us, this is holiness.* In other words, everything must be working towards the ultimate goal of fulfilling the Creator's plan, along a path of constant improvement. The world's resources, when used properly, play an integral part in this progress. The improper use of the world's resources works in the opposite direction – causing or allowing degradation. This principle is expressed by R. Moshe Chaim Luzzatto (1707-1746) in the classic mussar (ethical) work *Path of the Just*[691]:

אמנם הנה הוא עומד בשקול גדול . כי אם האדם נמשך אחר העולם ומתרחק מבוראו , הנה הוא מתקלקל ומקלקל העולם עמו. ואם הוא שולט בעצמו ונדבק בבוראו ומשתמש מן העולם רק להיות לו לסיוע לעבודת בוראו , הוא מתעלה והעולם מתעלה עמו.

> *In truth, Man is the center of a great balance. For if he is pulled after the world, and is drawn further from his Creator, he is degraded, and he degrades the world with him. And if he rules over himself and unites himself with his Creator, and uses the world only to aid him in the service of his Creator, he is uplifted and the world is uplifted with him.*

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[687] This appears to be similar to the second point in Boersema's 'thematic framework', of what he calls a "progressive history".

[688] R. Yaakov Tzvi Mecklenburg, *Ha'Ktav v'haKabalah*, (repr. Jerusalem, 2005), p. 52.

[689] B.T. Megilla 25b-26a. The Talmud rules that when selling an object with a level of holiness, such as a synagogue (house of worship), the object cannot be subsequently used for a purpose of lesser holiness, and the money received for the object can only be used to purchase something of equal or greater holiness, such as a Torah scroll.

[690] R. Akiva Tatz and R. Yaakov Branfman, *Rav Simcha Speaks*, (New York, 1994), p.108.

[691] R. Moshe Chaim Luzzatto, *The Path of the Just* (*Mesillat Yesharim*), trans. Shraga. Silverstein (Jerusalem and New York, 1980), p.21.

Historian Paul Johnson describes the integral importance of this principle (of Divinely-ordained purpose and progress towards the fulfillment of this purpose) in the Jewish tradition when he writes[692]: *No people has ever insisted more firmly than the Jews that history has a purpose and humanity a destiny. At a very early stage in their collective existence they believed they had detected a divine scheme for the human race, of which their society was to be a pilot. They worked out their role in immense detail… The Jews, therefore, stand right at the center of the perennial attempt to give human life the dignity of a purpose.*

5. The Creator uses the natural world as an instrument of reward and punishment for man, according to man's behavior[693].

This is a recurring theme in the Tanach[694], including the exile of the first humans from the Biblical Garden of Eden[695], the destruction of Sodom and Amorah[696], and the Biblical plagues in Egypt[697]. In the words of R. Hirsch[698]:

> *ארור האדמה בעבורך; in this curse, which the earth receives for the sake of mankind, for their betterment, we meet the first example of the flourishing, the blessing of the earth, running parallel, not only with the sunshine, rain, natural causes, but with the degree of obedience and faithfulness of Man to the laws of God. With the Torah, a beginning was to have been made for the world to return to its original harmonious condition. Eretz Yisrael was to have been a revival of Paradise on a small scale, which is why the Torah makes definite promises to be fulfilled here in this world. The way which leads back to Paradise is the way of life laid down and prescribed in the Torah.*

The Talmud also provides examples of this theme. For example[699]:

שכן מצינו בימי שמעון בן שטח , שירדו להם גשמים בלילי רביעיות ובלילי שבתות , עד שנעשו חטים ככליות ושעורים כגרעיני זיתים ועדשים כדינרי זהב , וצררו מהם דוגמא לדורות , להודיע כמה החטא גורם , שנאמר (ירמיהו ה') "עונותיכם הטו אלה וחטאתיכם מנעו הטוב מכם". (תלמוד בבלי מסכת תענית כג.).

> *And so we find, in the days of Shimon ben Shetach [a very righteous person in a very righteous generation], the rains fell for them on the evenings of the fourth day and the Sabbaths [which the Talmud says are the most ideal times for rainfall], until the wheat grew to the size of ox kidneys, the barley grew to the size of olives and lentils grew to the size of gold dinars [large coins]. They set aside some of them [these wondrous fruits] for future generations, to demonstrate how much is lost [to later generations] because of their sins, as it says (in Yirmeyahu, chapter 5), "and your iniquities perverted these and your sins prevented you from [receiving] the good [that was intended for you].*

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[692] Paul Johnson, *History of the Jews,* (New York, 1988), p. 2.
[693] Using the nomenclature introduced in the fourth chapter, this assumption can be expressed as: increasing *NQU* (in the form of righteousness) creates a situation where there is a miraculous (significantly greater than would be naturally expected) increase in *MPC* and *MQU* (material well-being for man). Decreasing *NQU* has the opposite effect.
[694] R. Hirsch, *Pentateuch*, vol. 1 (Genesis), p. 134.
[695] Genesis 3:23-24.
[696] Ibid. 19:24-25.
[697] Exodus, chapters 7-12.
[698] R. Hirsch, *Pentateuch*, vol. 1 (Genesis), pp. 86-87.
[699] B.T. Ta'anit 23a.

6. **Man has within him potentially destructive impulses which cause him to use resources counter to their created purpose (with the negative consequences described above in the previous underlying assumption). Man is commanded to and must learn to control these destructive impulses**

This principle focuses on human behavior rather than the conservation of material resources. Human character development requires learning to control impulses such as anger and greed which, if unbridled, can cause the needless destruction of resources. To repeat the words of the *Sefer HaChinuch*[700]:

וזהו דרך החסידים ואנשי מעשה אוהבים שלום ושמחים בטוב הבריות ומקרבים אותן לתורה , ולא יאבדו אפילו גרגר של חרדל בעולם, ויצר עליהם בכל אבדון והשחתה שיראו, ואם יוכלו להציל יצילו כל דבר מהשחית בכל כחם, ולא כן הרשעים אחיהם של מזיקין שמ חים בהשחתת עולם... שכל אדם חיב לגער ביצרו ולכבוש תאותו ... (ספר החינוך מצוה תקכט)

This is the way of the pious and elevated people; they love peace and rejoice in the good for other people, and to bring them near to The Creator's way. They will not waste even a mustard seed, and they are distressed at every ruination and spoilage they see, and if they are able to save, they will save anything from destruction with all of their power. Not so, however, are the wicked, the brethren of destructive forces that rejoice at the destruction of the world… Every person is obligated to master his inclinations and conquer his desires...

Similarly, in his description of *bal tashchit*, R. Hirsch writes[701]:

Therefore the sages say, he who in his wrath tears his clothes, breaks his vessels to pieces, or scatters his money, should in your eyes be as one who has worshipped idols…. And in truth, there is no one nearer to idolatry than he who can disregard the fact that things are property of The Creator, and who presumes also to have the right, since he has the might, to destroy them according to his presumptuous will. He is already serving the most powerful idol in his inward self - anger, pride, above all his ego, which in its passion regards itself as the master of all things.

7. **The Creator created man in order to bestow good upon him[702]. The Creator wants man to be sensitive to and appreciate this good and to relate to the Source of this good.**

This principle also focuses on human behavior rather than on the conservation of resources. One who recognizes and appreciates the value of material resources as gifts from the Creator will be less likely to waste or needlessly destroy them. A textual source for this principle is the Talmudic dictum[703]:

בירא דשתית מיניה לא תשדי ביה קלא (תלמוד בבלי מסכת בבא קמא צב:)

[700] *Sefer haChinuch*, commandment 529.
[701] R. Hirsch, *Horeb*, p.280.
[702] See for example the first chapter of: R. Moshe Chaim Luzzatto, *Path of the Just*, pp.16-27.
[703] B.T. Baba Kama 92b.

Don't throw dirt into a cistern that you drank from [that provided you with water]

According to R. Moshe Alshich (1520-1600) the root of the prohibition of *bal tashchit* is that the Creator wants to implant into our hearts appreciation and gratitude for everything - even towards inanimate objects - so that we won't deny the good that the Creator does for us[704].

[704] R. Moshe Alshich, *Torat Moshe* (Jerusalem, 1990), Book of Deuteronomy, (Deut. 20:19) p.225.

Appendix B - Biography of Rabbinic Authorities[705]

Brief biographies are provided below for Rabbinic Authorities that are quoted in this thesis (primarily in chapters 2 and 3). We have only included deceased Rabbinic authorities who are today widely recognized for their contribution to Jewish law and philosophy (with the exception of R. Ovadia Yosef, who is still living and is included because he is already widely accepted as a leading legal authority of Sephardic Jewry). These authorities are listed in the alphabetical order of their first names. The usual practice of alphabetizing according to the family name is less satisfactory because family names were not commonly used until recent times. Many of these authorities are widely known by another name (sometimes representing one of their well-known works, or an acronym of their name) as indicated in their biography below.

Avraham Ibn Ezra (1089-1167) – widely known as the "*Ibn Ezra*". A leading Biblical commentator, poet and linguistic scholar of medieval Spanish Jewry.

Avraham Saba (1440-1508), widely known as the "*Tzror Hamor*" for his commentary on the Torah. Born in Castille, Spain in 1440, from where he was exiled to Portugal, and later to Morocco.

Avrahom Yeshaya Karelitz (1878-1953) - widely known as the *"Chazon Ish"*. Formal leader and legal authority in the land of Israel; authored the seminal work *Chazon Ish* on the Talmud and *Shulchan Aruch*, and *Emunah u' Bitachon*, a treatice on faith.

Avraham Yitzchak Kook (1865-1935) - First Ashkenazi Chief Rabbi of pre-Israel Mandatory Palestine; innovative thinker, prolific author and charismatic leader, founder of Yeshivat Merkaz Harav in Jerusalem.

Aharon Halevi - (Died 1310) - Barcelona based sage believed by many to be author of the classic *Sefer Hachinuch*, a concise and clear exposition of each of the 613 commandments.

Asher ben Yechiel (1250-1327), widely known as the "*Rosh*" (acronym of Rabbeinu Asher) a leader of Ashkenazic Jewry and student of Rabbi Meir of Rothenburg, the Rosh was forced to flee to Spain, where he settled in Toledo and wrote legal commentary on the Talmud as well as numerous responsa.

Bachya ben Asher (14th century), widely known as "*Rabbeinu Bachya*", Biblical commentator who lived in Sargossa, Spain.

Chaim Falagi (1788-1868) - author of some 68 books, Falagi served as Rabbi of Izmir, Turkey for many years.

Chaim Elazar Shapira (1875-1937) - Chassidic leader in pre-war Hungary; authored responsa on various topics.

Chizkiyah Ben Manoach (1250-1310), widely known as the "*Chizkuni*" for his commentary on the Torah. His commentary was influenced by the French school of commentators who favored the literal approach of Rabbi Yosef Bechor Shor and the *Rashbam*.

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[705] I acknowledge the Orthodox Union (available at: http://www.ou.org/about/judaism/rabbis/default.htm) as the source for some of the information in these biographies.

David ben Samuel Halevi Segal (1586-1667), widely known as the "*Turei Zahav*" or by its acronym, the "*Taz*"; one of the major commentaries on the Shulchan Aruch. Born in the Ukraine and later settled in Lvov, Poland.

Elazer of Worms (1165-1230), widely known as the "*Rokeach*" for his commentary on the Torah. He was also renown throughout Germany as a halachic authority and author of Kabbalistic works.

Eliezer ben Shmuel of Metz (mid to late 12th century), widely known as The "*Yereim*", after his book by the same title, which was published in part in Venice in 1566, and fully in Vilna in 1892.

Eliezer Papo (1785-1828), widely known for his classical treatise "*Pele Yoetz*" which is an alphabetically organized ethical approach to building and perfecting character traits. Served as a communal Rabbi for Sephardic communities in Eastern Europe.

Eliezer Waldenberg (1915-2006), a prominent halachic authority who authored "*Tzitz Eliezer*", a collection of twenty two volumes of halachic responsa.

Eliyahu Kramer (1720-1797), widely known as the *"Gaon of Vilna"*, or the "*Gr'a*". The foremost scholar-sage of Lithuanian Jewry in the eighteenth-century, and the spiritual forefather for much of the 'litvak' yeshiva world. Known for his greatness in Talmudic and Kabbalistic study, he likewise mastered astronomy, mathematics and music.

Ephraim Fishel Weinberger (1912-1964), author of the halachic responsa "*Yad Ephraim*". Served as a Rabbi in Zalishizki, Poland. After surviving the holocaust, served as Rabbi of the Yad Eliyahu district in Tel Aviv, Israel.

Isaiah of Trani (b. 1180), also known as the *"Tosefot HaRid"* - Italian-based Biblical exegete and Talmudic scholar; author of the *Tosefot HaRid* commentary on the Talmud.

Menachem Azariah of Fano (1548-1620), widely known as "*Harema mipano*", prominent Italian Rabbi and Kabbalist.

Menachem ben Solomon Meiri (1249-1316), also known as the "*Meiri*" - Leading member of the Provence Talmudic school, Meiri wrote commentaries on nearly the entire Talmud which remained in manuscript until they were finally published in the early 20th century.

Menachem Mendel Schneerson (1902 -1994) – widely known as the "*Lubavitcher Rebbe*", a dynamic leader of Lubavitch Chasidim whose influence transcended his Brooklyn-based locale and whose diciples reached out to the entire Jewish world; author of many volumes of commentaries on Judaism.

Menachem Recanati (1223-1290), widely known as "*Recanati*", Italian author of the Kabbalistic work *Ta'amei HaMitzvot*, and author of a mystical commentary on the Torah.

Menachem Treves (died 1857) author of "*Orach Meisharim*", a 'code of law' for character development. Served as Rabbi of Salzburg, Austria.

Moshe Maimonides (1135-1204), commonly referred to, simply, as "Maimonides", or by the acronym "*Rambam*" (Rabbi Moshe ben Maimon). Considered the greatest Jewish leader of

Medieval times, Maimonides was a unique amalgam of immense Talmudic and Halachic scholarship, innovative philosopher and medical expertise. His prolific career included completing a classic commentary on the Mishna; the *Mishneh Torah*, a Halachic compendium codifying all the laws in the Talmud in organized manner, which remains authoritative in many communities until this day; *Moreh Nevuchim*, a philosophical treatise examining the rational underpinnings of Judaism based on classical Aristotelian philosophy, and numerous medical treatises.

Moshe Nachmanides (1194-1270), commonly referred to as "Nachmanides", or by the acronym "*Ramban*" (Rabbi Moshe ben Nachman) - Prominent Spanish Rabbinic authority, renown for his commentaries on the Torah and Talmud, and teacher of many of the great leaders of Spanish Jewry. Was also a renown physician.

Moshe Alshich (1520-1600) - member of Safed school of Kabbalists, authored a commentary on the Torah as well as responsa and other works.

Moshe Chaim Luzzatto (1707-1746) – widely known by the acronym "*Ramchal*". Kabbalist, philosopher and pietist. Born in Italy, and later lived in Holland and the land of Israel. His magnum opus, *Mesilat Yesharim*, deals with the perfecting character traits and achieving holiness.

Moshe Cordovero (1522-1570)-Kabbalist and pietist, member of the Safed school of scholars. Cordovero taught the great Rabbi Yitschak Luria (know as the "Ari"} whose innovations dominate Kabalistic thought until this day. Author of 32 books on Kabbala and ethical behavior.

Moshe Feinstein (1895-1986) - leading Rabbinic figure and a foremost legal decisor for 20th century Jewry. Author of *Iggerot Moshe*, responsa and novellae.

Moshe Mordechai Epstein (1865-1934), author of *Levushei Mordechai*, which included Talmudic novellae and Halachic Responsa. Was son-in-law and successor of Rabbi Nosson Zvi Finkel, who founded the Slabodka Rabbinical academy.

Moses ben Jacob of Coucy (early 13th century), widely known as the "*Smag*" which was an acronym for his book *Sefer Mitzvot Gadol*, which was one of the earliest codifications of Jewish law.

Moshe Sofer (1762-1838) – widely known as the "*Chatam Sofer*", leader of Hungarian Jewry, author of novellae Chatam (Acronym:Chidushei Toras Moshe) Sofer, as well as commentary on the Torah, and responsa.

Naftali Herz Kretchmer (nineteenth century), author of "*Noam Hamitsvot*" a treatise on the 613 commandments of the Torah. Taught in the Ponovezh Yeshiva, Lithuania.

Ovadia Yosef (b.1921) - Former Sephardic Chief Rabbi of Israel and currently the recognized leader of Sephardic Jewry. Author of many important works including responsa *Yabia Omer* and *Yechaveh Da'at*.

Samson Rafael Hirsch (1808-1888) - Rabbinic leader of German orthodox Jewry in the 19th century. Hirsch was a consummate orator and author who fought to maintain traditional orthodoxy in the age of enlightenment. His witty polemic and fiery rhetoric inspired Jews to maintain their commitment to traditional values. Hirsch published "*The Nineteen Letters*" (1836), *Chorev* (1838) - an exposition of the 613 Mitzvot, and his seminal commentary on the Torah. Hirsch was unique

in that he lived in Western Europe during the peak of the industrial revolution. Hirsch witnessed the material progress and the challenges it presented to his people, and formulated an approach for interpreting the Jewish sources in a way to deal with these challenges. Hirsch's approach is particularly relevant today where the material progress has further accelerated without the counterbalancing religious beliefs. From the time of the industrial revolution, most of the Torah leaders were in Eastern Europe, where they were little affected by the material progress. Also, they lived far more insular lives. Hirsch, on the other hand, attended the University of Berlin, a secular university, and was very much involved in secular life in Germany.

Shalom Mordechai Schwadron (1835-1911), widely known as the "*Maharsham*". Prominent legal decisor in pre-holocaust Eastern Europe.

Shimon Sofer (1850-1944), a grandson of Rabbi Moshe Sofer (see biography). Author of four books of halachic responsa called "*Hitorerut Teshuva*". Served as Rabbi of Erlau, Hungary for 64 years before perishing in Auschwitz along with most of his children.

Shlomo Ben Yitzchak (1040-1105), universally known as "*Rashi*". Considered the foremost Medieval Talmudic and Biblical commentator, and founder of the Ashkenazic- French school of Talmudic scholarship. Rashi studied with students of the Geonim and wrote commentaries on virtually the entire Talmud, which are fundamental material for any serious student of this work. Rashi's commentary on the Torah is a classic which has merited over a hundred supercommentaries, and his children and grandchildren led the Tosaphists, who made a seminal contribution to Talmudic scholarship.

Shmuel Ben Meir (1080-1160), widely known by the acronym "*Rashbam*". Biblical and Talmudic commentator, and grandson of the classic Torah commentator *Rashi* (Rabbi Shlomo ben Yitzchak).

Shmuel Bornstein (1856-1926), widely known as the "*Shem Mishmuel*" for his commentary on the Torah. Chassidic Rebbe in Sochatchov, Poland, and grandson of the Kotzker Rebbe.

Shmuel David Luzatto (1800-1865), known by his acronym *Shadal*, lived in Italy, and authored commentaries on the Torah as well as many of the prophets. He was also a prolific writer on a broad range of topics including Medieval Jewish poetry, Kabbalah and Jewish thought.

Shmuel Di Uzeida (16th century) – mystic who lived in Safed and author of *Midrash Shmuel*

Shmuel Eliezer Edels (1555-1631) – widely know as the "Maharsha" - wrote commentary on the Talmud, including a clear explanation of difficult Aggadata. His brilliant and terse style makes his work a challenge even for seasoned Talmudists. Served as a Rabbi in Eastern and Central Europe.

Shneur Zalman of Liadi (1745-1813) – widely known as the "*Ba'al HaTanya*". Founder of Lubavitch Chasidic dynasty, Shneur Zalman was probably the most influential Chasidic leader after the demise of his teacher, Rabbi Dov Ber of Mezeritch. A master of both the classical works of Jewish law and the Kabbala of the Lurianic masters, he wrote *Tanya* to present the deeper ideas of Judaism to the masses and a Codex (*Shulchan Aruch Harav*) of Halachic conduct, of which only a small part survived a fire in his home.

Simcha Wasserman (d. 1992), a leading educator of 20th century Orthodox Jewry, pioneering a revival of Torah study in France, the U.S. and Israel. Son of one of the leaders of pre-holocaust European Jewy, R. Elchanan Wasserman.

Simcha Zissel Ziv (1824-1898), widely known as the "*Alter of Khelm*", prominent leader of the Mussar (ethical character development) movement in the Eastern European Yeshiva world, and one of the three leading students of R' Yisrael Salanter who founded the 'Mussar movement'.

Yaakov Reichler (1670-1733) - Rabbi in Prague, Ansbach and Worms, and author of *Shvut Yaakov*, a book of halachic responsa.

Yaakov Ben Asher (1270-1342) – widely known as The "*Tur*" (after the title of his most famous work, the *Arbah Turim*) or as "Ba'al Ha'Turim [Master of the Turim]. Early codifier of Jewish law who lived in Toledo, Spain, and whose principal work was a predecessor to the *Shulchan Aruch*. He was the son of R. Asher ben Yechiel, or the Rosh, who is listed above.

Yaakov Kuli (1689-1732), Author of *Me'am Loez*, born in Jerusalem and lived most of life in Constantinople, Turkey

Yaakov Tzvi Mecklenburg (1785-1865) – Rabbi of Koenigsburg in the nineteenth century, author of *Haktav Vehakabbala*, showing the innate connection between the written Torah (Ktav) and the Oral transmission of its meaning (Hakabbala).

Yair Chaim Bacharach (1638-1702) – German-based author of *Chavot Yair*, responsa on various topics,

Yehuda Loewe (1516-1609), known as the "*Maharal*". Served as the Rabbi of Prague and leader of central European Jewry. Prominent Kabbalist and innovative thinker on the entire spectrum of Jewish thought. Authored many works on Jewish philosophy as well as commentaries on the Torah and Talmud.

Yerucham (1280-1350) – widely known as *"Rabbeinu Yerucham"*. Provence-born early authority, student of Rabbeinu Asher (*Rosh*), authored works on monetary law and on dietary laws.

Yeshaya Halevi Horowitz - (1558-1630) - widely known as the "*Shelah*" based on the acronym of his book *Shnei Luchot Habrit*. Rabbi Horowitz served as Rabbi in various places in Eastern Europe before emigrating to Israel in his later years.

Yisrael Avraham Alter Landau (1894-1977), widely known as the "*Beis Yisrael*"; author of Biblical commentary and Rabbinic Responsa under the same name. Former Rebbe or leader of the Ger Hassidic sect; escaped the holocaust and settled in the land of Israel.

Yisrael Lifshitz (1782-1861), widely known as the *Tiferet Yisrael* after his classic commentary on the Mishna which included explanatory prefaces and scientific background to the subjects discussed. Lived in Danzig.

(Don) Yitchak Abarbanel, (1437-1508), widely known as the "*Abarbanel*", Sephardic Bible commentator and community leader. As chief financier of King Ferdinand of Spain, he resigned his prominent position to lead his brethren into exile with the Spanish expulsion.

Yitzchak Alfasi (1013-1103), widely known as the "*Rif*", and acronym for Rav Yitzchak of Fez. Sephardic legal decisor who wrote an abridged version of the Talmud which focused exclusively on legal matters, and which is still included in modern editions of the Talmud.

Yitzchak ben Yehudah Halevi (16th - 17th Century), widely known as the "*Pa'aneach Raza*" for his commentary on the Torah (published 1607), which emphasized the gematrias (numerical values) and acronyms in the Torah.

Yoel Sirkis (1561-1640), widely known as the "*Bach*" (acronym for his commentary on the Tur, which he titled "Bayit Chadash"), a prominent legal decisor. The Bach lived in central Europe and held rabbinical positions in Belz, Brest-Litovsk (presently part of Belorusia), and Cracow.

Yoel Teitelbaum (1887-1979) – widely known as the "*Satmar Rebbe*". Former leader of the Satmar Chassidim. After surviving the Holocaust he settled in Williamsburg, New York. Author of *Divrei Yoel* on the Torah and *Vayoel Moshe*.

Yom Tov Lippmann Heller (1579-1654), widely known as the "*Tosafot Yom Tov*"; was the Rabbi of Prague, and author of a commentary on the Mishna, as well as glosses on the Talmud.

Yonah ben Avraham of Gerona (d 1263) – widely known as "*Rabbeinu Yonah*"; Pietist and Talmudic sage, author of *Shaarei Teshuva* , a treatise on repentance.

Yosef Albo (1380-1444) – Spanish philosopher and polemicist, author of *Sefer Ha'ikarim* on the basic doctrines of Jewish faith.

Yosef Babad (1800-1874) – author of *Minchat Chinuch*, a commentary and glosses on the *Sefer Hachinuch* of Rabbi Aharon Halevi. Lived in Tarnopol, in the Ukraine.

Yosef Caro (1488-1575) - author of the universally accepted code of Jewish law, *Shulchan Aruch*, and leader of the 16th century Safed school of scholars. He also authored a commentary on Maimonide's *Mishneh Torah*, called, *Kesef Mishneh*, and a volume of responsa, called *Avkat Rochel*.

Yosef Dov HaLevi Soloveitchik (1903 – 1993), known to his followers as "*The Rav*" - born into a family of renown Torah scholars. Was the leader of "Modern Orthodoxy" in America, and the Rosh Yeshiva of Yeshiva University. His accomplishments in both Torah study and secular knowledge made him a unique Torah personality throughout the world.

Yosef Yuspa Hahn (1570-1637) – author of *Yosef Ometz*,

Zvi Ashkenazi (1660-1718)- also know as the "*Chacham Zvi*". Dutch-based Rabbi and legal decisor.

Appendix C. The principle of *bal tashchit* as an explanatory tool for the conflict between the 'cornucopians[706]' and the 'doomsayers[707]'

The principle of *bal tashchit*, as described in this thesis, puts great importance on man and his development (ability to produce *NQU*). According to this principle, the relationship between the human population and the quality of the environment has significant variability, depending on man's level of development. An increasing human population can have a negative, neutral or, possibly, even positive effect on the quality of the environment depending to a number of factors, as will be discussed below. I suggest that the principle of *bal tashchit* can play a useful explanatory role in the current dispute between those who consider population growth to be a necessary cause of environmental degradation (represented at the extreme by the environmental doomsayers) and those who don't (represented at the other extreme by the cornucopians). The following text will illustrate how the principle of bal tashchit can contribute to this discussion.

A brief history of man's relationship with his environment

Much of human history can be seen as the development of man's ability to master his environment – to identify and utilize the natural resources around him to supply his basic needs, and if possible, his wants and desires[708] that go beyond basic needs. For most of human existence, the availability of natural resources was severely limited by a lack of knowledge of what resources were potentially available, and a lack of knowledge of and/or ability to exploit the resources that were known. This lack of knowledge and technical ability severely limited the material development of mankind. The human population, and the standard of living of most societies remained remarkably low - by today's standards - until the time of the industrial revolution.

The Industrial Revolution

The industrial revolution, beginning in England in the eighteenth century, brought about major changes in the material development of human society. With the industrial revolution came great discoveries in the natural sciences which increased knowledge of the physical world including the new knowledge of the availability and uses of natural resources. Man's ability to exploit the natural world to meet his needs and wants increased dramatically. A major part of this change and its effects on the natural world was the development and harnessing of inanimate forms of energy – such as the 'heat engine' (primarily the steam engine, beginning in the late eighteenth century and the internal combustion engine, beginning in the late nineteenth century). The energy released by the controlled combustion of natural resources such as wood, and later, coal and oil replaced human or animal labor to provide previously unavailable physical power to human society. Exploiting this newly available energy consumed vast amounts of natural resources while enabling man to utilize the natural resources around him to a far greater extent.

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[706] 'Cornucopian' is a name given to those who believe that through human innovation the world can provide a practically limitless abundance of natural resources. I am also referring to this group as the 'Anti-Malthusians', as will be discussed later in this appendix.

[707] 'Doomsayer' is a name given to those who believe that all or parts of humanity are doomed by human population growth and/or high consumption rates and their affects on the environment. As will be discussed later in this appendix, I am also referring to this group as the 'Malthusians'.

[708] A number of books have been written on this subject. For example, Jared Diamond has authored *Collapse – How Societies Choose to Fail or Succeed* (Viking, 2005).

The dramatic increase in the availability of material resources to human society provided the necessary conditions for a concomitant increase in the human population and in the material standard of living, accompanied by great advances in scientific knowledge and technology. All of this had a dramatic influence on man's relationship with the natural world around him. The post World War II period saw an even greater increase in man's development and exploitation of the natural world, particularly in the non-western world.

Effects on the quality of the environment

Along with providing a tremendous amount of energy and other resources with which to power industry, and to help feed, house, and otherwise support the growing and increasingly affluent human population, the changes described above had a profound negative impact on the quality of the natural environment. Natural resources such as air and water became increasingly polluted. Large areas of land became denuded of natural habitat – either transformed into human habitat, such as towns and cities or otherwise stripped of native flora and fauna and exploited to meet man's growing needs and wants for material resources. In the words of Russian geographer I.P. Gerasimov[709]: *By taking energy and matter from the environment and returning them in converted – industrial, domestic and other – forms society interferes with the dynamically balanced cycles of natural processes. However, as a result of its long evolution, nature has 'acquired' an ability to restore disrupted natural processes… Thus the natural environment taken as a whole was able, up to a point, to withstand anthropogenic disturbances, although there were also local irreversible changes. Since the industrial revolution, the general intensity of human impact on the environment has exceeded its potential for restoration in many large areas of the earth's surface, leading to irreversible changes not only on a local but also a regional scale*.

The natural environment in the industrializing and industrialized world was greatly altered as a result of the industrial revolution. For example, vast areas of Europe, and later, North America and parts of Asia were deforested to provide the fuel for furnaces and for wood burning heat engines as well as paper and building materials. In addition, forests were cleared to produce more food to feed the growing populations. With the shortage of wood, the main source of energy shifted to coal, which resulted in a great deal of environmentally degrading mining activity, as well as increased air pollution. Later, oil and mineral gas became the dominant sources of energy for much of the industrialized world, resulting in their own environmental impacts. The extraction, transport, processing and combustion of these fuels, as well as the necessary processes to produce other resources used by the growing and developing human population all made their mark on the environment.

[709] I.P. Gerasimov, "Problems of natural environment transformation in Soviet constructive geography", cited in: Andrew Goudie, *The Human Impact on the Natural Environment*, 5th ed. (Cambridge, 2000), pp. 8-9.

Concern over exhaustion or destruction of the natural environment

Concern over the exhaustion or destruction of the natural environment from human overpopulation has a surprisingly long history. In the words of population expert Joel Cohen[710]: *this worry is as old as recorded history. Cuneiform tablets from 1600 B.C.E showed that the Babylonians feared the world was already too full of people*. Eighteen hundred years ago the Roman theologian Tertullian wrote[711]: *What most frequently meets our view and occasions complaint is our teeming population. Our numbers are burdensome to the world, which can hardly support us*. American author Bruce McKibben writes[712]: *Plato, Euripides, and Polybius all worried that we would run out of food if the population kept growing; for centuries a steady stream of economists, environmentalists, and zealots and cranks of all sorts have made it their business to issue estimates either dire or benign [about the problem of human overpopulation]*.

Some historians believe that several ancient civilizations around the world came to an end due primarily to the depletion of the natural resources upon which their survival was based[713]. Nevertheless, until the industrial revolution, the concern of destroying the environment or running out of resources was usually confined to limited geographical regions and time periods.

1.3.1 Malthus and the Neo-Malthusians

In 1798, in the early stages of the industrial revolution, the English economist Thomas Malthus published his famous *Essay on the Principle of Population*[714]. In this essay, Malthus predicted that the increasing human population would soon overreach the availability of necessary resources - leading to dire consequences such as massive human starvation, disease, warfare and destruction. According to the American author Ben Wattenberg[715]: *the ideas that Malthus put forth have pervaded scientific and humanist thought encompassing topics as apparently diverse as food, disease, economics and the environment. For 200 years, the intellectual world has been divided between Malthusians and anti-Malthusians, with each side respectively saluting or scorning his ideas.*

In more recent times, a number of what might be called 'neo-Malthusians' have continued to predict inevitable and fast approaching disastrous results of the increase in human population[716]. While Malthus limited his focus to the increase in human population, many of the neo-Malthusians saw the threats of self-annihilation amplified by the development of new technologies and increasing per capita consumption of natural resources. Dominant amongst these predictions is the inevitable exhaustion and/or pollution of vital natural resources – the resources that man

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[710] Joel E. Cohen, "Human Population Grows Up", *Scientific American*, Special Issue, Crossroads for Planet Earth (September 2005), p.31.
[711] Clark Wolf, "Population, Development, and the Environment", *Environmental Ethics*, David Schmidtz and Elizabeth Willott ed. (Oxford, 2002), p.267.
[712] Bruce McKibben, "A Special Moment in History", *The Atlantic Monthly*, vol. 281, no. 5, (May 1998) p.55.
[713] This includes the ancient Mayan civilization in Central American, and the Easter Island Civilization in the Pacific. Jared Diamonds book *Collapse* (Viking 2005) examines these and other lost civilizations for the causes of their collapse. Diamond finds five main causes for societal collapse: environmental damage, climate change, hostile neighbors, decreased support by friendly neighbors, and [inadequate] societal responses to its problems (pp.11-15).
[714] Thomas Malthus, *An Essay on the Principle of Population, as it Affects the Future Improvement of Society with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and Other Writers*, (London, 1798).
[715] Transcripts from the Public Broadcasting System radio show Think Tank, hosted by Ben Wattenberg, on http://www.pbs.org/thinktank/transcript625.html.
[716] for example, see *The Population Bomb*, (Berkeley, 1968) by Paul Ehrlich and *Limits to Growth*, (New York, 1972).

requires to sustain his existence on the planet, and more recently, concern over anthropogenic climate change and the loss of biodiversity.

In the early 1970's, biologist Paul Ehrlich (arguably the most prominent of the neo-Malthusians), along with physicist John Holdren, devised the well-known Ehrlich-Holdren equation. This equation states that $I = P*A*T$, where I stands for environmental impact, P stands for human population, A stands for affluence (resources consumed per capita) and T stands for technology (environmental degradation and pollution per unit of resource used)[717].

The Ehrlich-Holdren equation explained man's impact on his environment as a function of the size, level of resource consumption and level of technology of the human population. All three of these increased significantly during the period beginning with the industrial revolution, which was accompanied by increasing degradation of the environment and the natural resources which the environment provides.

Challenges to Malthusian Claims

Interestingly, none of the disasters that Malthus, and the neo-Malthusians after him predicted have actually occured; at least not on a significant scale. McKibben - an environmentalist concerned about the negative effects of overpopulation - concedes[718]: *Each new generation of Malthusians has made new predictions that the end was near, and has been proved wrong. The late 1960s saw an upsurge of Malthusian panic. In 1967 William and Paul Paddock published a book called 'Famine -- 1975!', which contained a triage list: "Egypt: Can't-be-saved.... Tunisia: Should Receive Food.... India: Can't-be-saved." Almost simultaneously Paul Ehrlich wrote, in his best-selling 'The Population Bomb' (1968), "The battle to feed all of humanity is over. In the 1970s, the world will undergo famines -- hundreds of millions of people will starve to death."*

Not surprisingly, then, Malthusian claims have been strongly challenged. McKibben writes about Malthus and his claims[719]: *Few other writers [besides Malthus] have found critics in as many corners. Not only have conservatives made Malthus' name a byword for ludicrous alarmism, but Karl Marx called his essay "a libel on the human race," Friederich Engels believed that "we are forever secure from the fear of overpopulation," and even Mao Zedong attacked Malthus by name, adding, "Of all things in the world people are the most precious."*

1.3.4 The 'anti-Malthusians'

Amongst the most notable of the modern challengers to Malthusian predictions have been the late American economist Julian Simon, and more recently, Bjørn Lomborg, a Danish statistician who was heavily influenced by Simon's work. Both have authored books disputing the claim that man is exhausting the vital natural resources upon which his existence is based[720]. More significantly, Simon and Lomborg, amongst others (sometimes referred to as the *cornucopians*), claim that man's material welfare – which is dependent on the availability of natural resources -- is

[717] Miller, p.21.
[718] McKibben, p.55.
[719] Ibid.
[720] See for example Julian Simon, *The Ultimate Resource 2*, (Princeton, 1996); and Bjørn Lomborg, *The Skeptical Environmentalist*, (Cambridge, 2001).

improving and will continue to improve in the foreseeable future. In the words of Simon[721]: *This is my long-run forecast in brief: The material conditions of life will continue to get better for most people, in most countries, most of the time, indefinitely. Within a century or two, all nations and most of humanity will be at or above today's Western living standards. I also speculate, however, that many people will continue to think and say that the conditions of life are getting worse*.

Much of Simon's work was based on two previous studies. The first of these was a study published by Danish economist Ester Boserup in 1965[722]. As McKibben writes[723]: *This group [Simon, Lomborg, et al.]'s intellectual fountainhead is a brilliant Danish economist named Ester Boserup -- a sort of anti-Malthus, who in 1965 argued that the gloomy cleric had it backward. The more people, Boserup said, the more progress. Take agriculture as an example: the first farmers, she pointed out, were slash-and-burn cultivators, who might farm a plot for a year or two and then move on, not returning for maybe two decades. As the population grew, however, they had to return more frequently to the same plot. That meant problems: compacted, depleted, weedy soils. But those new problems meant new solutions: hoes, manure, compost, crop rotation, irrigation. Even in this century, Boserup said, necessity-induced invention has meant that "intensive systems of agriculture replaced extensive systems," accelerating the rate of food production.*

The other study was a book called *Scarcity and Growth* that was written by Harold Barnett and Chandler Morse. In a tribute to Julian Simon, Economist David R. Henderson writes[724]: *All this [Simon's thesis that we are not running out of resources] is consistent with what resource economists have been saying for decades. In* Scarcity and Growth, *a 1963 book financed by Resources for the Future, a Washington, D.C., think tank devoted to the study of natural resources, the economists Harold J. Barnett and Chandler Morse showed that between 1890 and 1957, costs per unit of mineral output declined "rapidly and persistently." This trend, they noted, fundamentally contradicted the Malthusian hypothesis of increased scarcity. Simon referred to* Scarcity and Growth *as "the great book which was my tutor." Simon made it his mission to popularize the findings of its authors so that people could see an alternative to the views of alarmists like Mr. Ehrlic*h.

Current Situation

Today, the picture is far more complex than it was prior to the industrial revolution. The human population has increased more than six-fold since the beginning of the industrial revolution to over 6.5 billion people. Per capita consumption of many important resources has increased even faster than the population, and has continued to increase even as human population growth has decreased and stabilized in much of the developed world. For example, world *per capita* energy consumption increased over fifteen-fold from 1800 to 1987[725]. These increases in population and consumption levels have greatly increased the human demand for natural resources. They have also contributed to the increasing degradation of the environment – by means of extractive activities such as deforestation and mining and by the massive release of waste materials which cause environmental pollution. The situation is further complicated by the great variety of non-biodegradable and hazardous materials that are commonly used today, and by the extensive movement (importation and exportation) of natural resources in the increasingly global economy.

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[721] Julian Simon, *Regis* 1997:198, as quoted in Lomborg, (2001), p.vii.
[722] Ester Boserup, *The Conditions of Agricultural Growth*, (London, 1965).
[723] McKibben, p.75.
[724] David R. Henderson, "In Memoriam Julian Simon", *Red Herring Magazine*, (June 1, 1998), available at: http://www.davidrhenderson.com/articles/0698_inmemoriamjuliansimon.html.
[725] Joel E. Cohen, *How Many People can the Earth Support?* (New York, 1996) p. 99.

In addition, it has become increasingly evident that human activities are contributing to changes[726] in the basic functioning of the world's ecosystems – for example, anthropogenic climate change – that threaten the long-term stability of our life-support system.

Situation in the Developed World and the Developing World

When discussing man's development of the natural environment, a distinction is commonly made between developed countries and developing countries. Developed countries - found primarily in Europe and North America – have already industrialized and achieved a measure of stability in terms of industrial development. Developing countries – found mainly in Asia, Africa and much of South and Central America, as well as parts of Eastern and Southern Europe are currently in the process of development. Some countries, such as China, India and Brazil, (which together make up over a third of the total human population) are developing at a particularly rapid rate.

While population growth has stabilized at near or even below replacement levels in most of the developed countries, it remains relatively high in much of the developing world. The total human population is projected to reach ten billion by the year 2050, and to stabilize at close to 12 billion by the end of the 21st century[727]. Per capita consumption of natural resources is also growing - particularly in the developing world where the population is sometimes increasing the fastest[728]. Therefore, the challenge of providing the necessary resources to meet the needs and wants of the human population over the foreseeable future can be expected to significantly increase. Along with the increasing human population and levels of consumption has come an increasing concern over the long term availability and welfare of the planet's natural resources.

Coming to terms with the neo-Malthusian vs anti-Malthusian Argument

It seems utterly remarkable that there could be such a divergence of opinion between the neo-Malthusians and the anti-Malthusians. Both sides are represented by respected academicians who are privy to the same data and who bring a wealth of research to back up their respective positions. The key difference between these conflicting sides – as is discussed below – rests in the perceived ability and likelihood of man to positively adapt to what will undoubtedly be increasing challenges in the management of the planet's natural resources.

The neo-Malthusians extrapolate from the behavior of non-human organisms – which have population limits which cannot be exceeded without catastrophic results. They view man as being bound by the same limitations, and therefore, subject to the same resource limits which cannot be overstepped without inviting disaster. For example, Harold Dorn writes[729]: *No species has ever been able to multiply without limit. There are two biological checks upon a rapid increase in number – a high mortality and a low fertility. Unlike other biological organisms, man can choose which of these checks shall be applied, but one of them must be.*

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[726] These changes, including reductions in biodiversity and climate change, are further discussed in chapter 6 (section 6.3).

[727] Cohen (1996), pp.136-152.

[728] This is particularly true today in China and India, two countries containing between them almost a third of the world's population, and which are rapidly developing and increasing per capita consumption, although China's population is not growing at the rate of most of the developing world.

[729] Harold F. Dorn, as quoted in Cohen (1996), p.367.

The anti-Malthusians optimistically view man as being capable of transcending the limitations of other living beings through innovation and adaptation. Henderson writes[730]: *In* The Population Bomb, *Mr. Ehrlich generalized from animal behavior -- he had studied butterflies--to human behavior. But Simon saw humans as fundamentally different from animals. He liked to quote the 19th-century American economist Henry George: "Both the jayhawk and the man eat chickens, but the more jayhawks, the fewer chickens, while the more men, the more chickens.* Simon, Lomborg, and others attribute this to human ingenuity in discovering more effective and efficient ways of finding and utilizing needed resources. Lomborg writes[731]: *That we can both use resources better and find more and more could be subsumed under the idea of human ingenuity. True, the earth is spherical and limited, but this is not necessarily a relevant objection. The problem is rather how large are the deposits that are actually accessible for exploitation. These deposits can seem limited, but if price increases this will increase the incentive to find more deposits and develop better techniques for extracting these deposits. Consequently, the price increase actually increases our total reserves, causing the price to fall again... Actually, the question of whether resources are becoming more scarce or more abundant is staked on these two approaches: doomsayers claiming that resources are physically limited and consequently must grow scarcer and cornucopians focusing on human ingenuity and the empirical evidence of the data. Whether the one or the other is right is in truth an empirical question*.

Similarly, Simon writes[732]: *Greater consumption due to an increase in population and growth of income heightens scarcity and induces price run-ups. A higher price represents an opportunity that leads inventors and business people to seek new ways to satisfy the shortages… A few succeed and the final result is that we end up better off than if the original shortage problems had never arisen*.

The overall prognosis for the availability and wellbeing of vital natural resources – and therefore, the welfare of mankind - remains unclear. As described above, there is a remarkable divergence of opinions. Some claim we are rapidly exhausting and destroying the natural resources we need to survive and others claim that the actual situation is improving. The majority are ensconced somewhere between these extremes.

Bill McKibben, after conceding that Malthus and the neo-Malthusians have always been wrong in the past, expresses great concern that they may yet be proven correct when it comes to newer challenges such as anthropogenic climate change. He writes[733]: *There are no silver bullets to take care of a problem like this [climate change]. Electric cars won't by themselves save us, though they would help. We simply won't live efficiently enough soon enough to solve the problem. Vegetarianism won't cure our ills, though it would help. We simply won't live simply enough soon enough to solve the problem…The bottom-line argument goes like this: The next fifty years are a special time. They will decide how strong and healthy the planet will be for centuries to come. Between now and 2050 we'll see the zenith, or very nearly, of human population. With luck we'll never see any greater production of carbon dioxide or toxic chemicals. We'll never see more species extinction or soil erosion. …So it's the task of those of us alive right now to deal with this special phase, to squeeze us through these next fifty years.*

As McKibben expresses in his article, climate change is a challenge on a different scale than the threat of running out of resources, which was the previous focus of the debate between the

[730] Henderson (1998).
[731] Lomborg (2001), p.124.
[732] Simon (1996), p.12.
[733] McKibben (1998).

Malthusians and the neo-Malthusians. It is clear that what is being done until now is not enough to prevent or address undesirable, anthropogenic changes such as climate changes and reduced biodiversity. The question is, will man be able to meet the challenges such as climate change and loss of biodiversity in the same way we met earlier challenges, or, this time, will this be beyond our ability to innovate and adapt?

Approaching the dispute between the 'neo-Malthusians' (doomsayers) and the 'anti-Malthusians' (cornucopians) with the principle of *bal tashchit*

As discussed above, the neo-Malthusians view increasing population and rising affluence as strictly negative factors, causing the destruction of man's resource base – the natural world. This is demonstrated by the Ehrlich-Holdren equation[734] which explains man's impact on his environment as a function of the size, level of resource consumption and level of technology of the human population. When introduced in the early 1970's, the Ehrlich-Holdren equation appeared to be a reasonable description of the period that began with the industrial revolution which saw a dramatic increase in each of these factors along with the degradation of the environment and the natural resources which the environment provides.

Re-examining the Ehrlich-Holdren equation from the perspective of this thesis suggests that the effects of two of the factors – *population* (P) and *technology* (T) – are actually quite variable. *Population* can be an asset (up to a limit, which has yet to be determined[735]) or a deficit depending on the level of intellectual development and moral-ethical behavior of the population. I suggest that there are four basic scenarios, depending on the two variables of population size and *NPC*/capita (which is a combination of intellectual development and moral-ethical behavior), as illustrated below in *Table A.1*.

Small Population High *NPC*/capita	Large Population[736] High *NPC*/capita
Small Population Low *NPC*/capita	Large Population Low *NPC*/capita

Table A.1 - Four Basic Scenarios for variances in Human Population and NPC/capital

[734] To review, the Erlich-Holdren equation states that: I = P*A*T, where *I* stands for environmental impact, *P* stands for human population, *A* stands for affluence (resources consumed per capita) and *T* stands for technology (environmental degradation and pollution per unit of resource used).

[735] See Cohen (1995), p.364, who writes: *For humans now, the notion of a static, passive equilibrium is inappropriate, useless. So is the notion of a static "human carrying capacity" imposed by the natural world on a passive human species.*

[736] I am defining 'large population' as a total human population of 9.2 billion, which is a commonly-used prediction by the United Nations for the year 2050. See: United Nations, Department of Economics and Social Affairs, Population Division, *World Population Prospects – the 2006 Revision*, Executive Summary, (2007), available at: http:www.un.org/esa/population/publications/wpp2006/English.Pdf.

From the standpoint of this thesis, the upper right-hand quadrant is the optimal situation, with a large population at a high level of NPC/capita producing a high level of *NQU*. The worst-case scenario would be in the lower right-hand quadrant with a large population but low *NPC*/capita – where we can expect that there would be a very high level of degradation of *MQU* with all of the associated environmental problems that would result, and low production of *NQU* for addressing these problems. We can call the upper right-hand corner the domain of 'Simon man'[737] – where large population leads to progress and improvement of the quality of life. The lower right-hand corner can be called the domain of 'Ehrlich-man'[738] – where large population inevitably leads to environmental destruction and disaster.

'Technology' (defined in the Ehrlich-Holdren equation as environmental degradation per unit of resource used) has actually been decreasing – particularly in the developed world - as technology and 'resource productivity' improves. In fact, *technology* has become more and more of a positive factor in resource management, enabling man to do more with less resources. Only *'affluence'* (defined as resource consumption per capita) remains a definite concern, and this factor is exactly what the prohibition of *bal tashchit* comes to address – to ensure that the benefits from any consumption of resources outweigh the costs.

Two aspects of *NQU* (as described in section 4.3.4) play an important role in resource management. In situations where there is a shortage of resources, the knowledge side of *NQU* is dominant, as man creatively innovates to find solutions to the shortage. For example, shortages create economic incentives to find substitutes for the endangered resources or for developing ways to use the resource more efficiently. In times of plenty, where economic incentives to conserve are lacking, the 'righteous'[739] side of *NQU* is dominant, motivating people to wisely use resources despite the natural tendency to waste that which is abundant and inexpensive.

The crucial factor determining which side or the other in this debate is most correct, in my opinion, is the production and development of *NQU* (knowledge and righteousness) in the human population. It may well be that, without the proper production and development of *NQU*, the doomsayers are correct and the human population should be (or perforce will be) severely limited.

Despite a long history of empirical evidence to the contrary, the neo-Malthusians have repeated the same error, in my opinion, of projecting into the future (where increasing population and consumption *at the same level of NQU* would be a concern) without allowing for the effects of increasing *NQU*. One can infer from this that the neo-Malthusians lack an appreciation for the uniqueness of man – as a producer of *NQU* – and continue to extrapolate from the behavior of animals under stress to the behavior of man under stress.

Despite their apparent errors, the neo-Malthusians and other 'doomsayers' play an important role in helping to bring needed attention to potential dangers[740]. Production of *NQU* can be a costly process, and credible threats of impending disaster help to mobilize the necessary resources (for example, they help assemble financing and political support for research and education) to come

[737] This refers to Julian Simon, as described above, who claims that increasing human population can be beneficial both for man and his environment, because of increasing innovation-driven progress.
[738] This refers to Paul Ehrlich, as described above, who takes the position that increasing human population is harmful to the environment.
[739] See section 4.3.4 for a discussion of what I am calling 'righteousness', or proper moral-ethical behavior.
[740] One prominent example may be Rachel Carson's seminal book *Silent Spring* (New York, 1962), which helped usher in the environmental movement.

up with innovative responses to these threats. Without the 'doomsayers', we might not respond in time. It may even be possible to say that where true 'righteousness' is lacking, the 'doomsayers' provide a substitute of sorts – redirecting *NPC* to address the potential problems before they become overwhelming.

Anti-Malthusians such as Simon view the increasing human population and affluence in positive terms, thanks to man's creative intelligence. While, the principle of *bal tashchit*, as I have described it, favors the position of the anti-Malthusians, there are important points of divergence. Anti-Malthusians correctly identify increasing knowledge (part of what I am calling *NQU*) as a critical element in the sustainable management of resources, but some seem to miss the point that for facilitating sustainability with a high quality of life there are other necessary prerequisites. In my opinion, it is unrealistic to assume that increasing knowledge alone, in conjunction with free markets, will necessarily lead to proper solutions. Innovating our way out of serious problems is not automatic; there are limitations, as economist Geerat Vermeij writes[741]: *Even in today's establishment of organized research, great breakthroughs depend on the talents of a few individuals. The pool of highly talented scientists, inventors, and entrepreneurs clever enough to solve the most intractable problems and with enough savvy to bring the solutions into the marketplace is likely to be proportional to the overall size of the population. This is the crux of the argument by Julian Simon and other economists in favor of an increase in the human population as the best way to innovate ourselves out of our collective predicaments. In order for population growth to have this effect, however, everyone must be afforded the educational and employment opportunities to realize their intellectual or entrepreneurial potential. This means that population growth must be closely linked either to an abundance of resources and to a permissive attitude toward innovation in society, or to an increase in resources and social mobility. Growth in the number of individuals by itself is neither sufficient nor even necessary; it must be accompanied or replaced by per capita economic growth, by individual liberty, and by inclusive participation in the discovery and implementation of solutions and social goals. It is no accident that Greece, with perhaps the earliest version of democratic government in some of its city-states, produced a disproportionately large number of extraordinary thinkers despite a small population*.

I would go further than Vermeij. As I discuss in chapter seven (section 7.4.3), what I am calling 'righteousness' plays an underappreciated and, in my opinion, vital role in the sustainable management of resources. Only with the production and maintenance of the full spectrum of *NQU* (knowledge, righteousness and the necessary institutional infrastructure for maintaining these) can there be sustainable human progress. I suggest that this is alluded to in Deuteronomy 20:19-20, upon which the principle of *bal tashchit*, as I have described it in this thesis, is based[742].

[741] Geerat J. Vermeij, *Nature; an Economic History*, (Princeton, 2004), pp. 306-307.
[742] See chapter two (particularly section 2.2) and chapter four (particularly section 4.2 and 4.3) for more discussion on this.

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This bibliography is divided into two sections. The first section is a *bibliography of Rabbinic sources*. These sources are arranged alphabetically according to the first name of the author[743], or, according to the name of the book. Since most of the Rabbinic sources are in Hebrew, I will only indicate those sources in English, with an *Eng*. at the end of the listing.

The second section is a *general bibliography*, which includes all non-Rabbinic sources. These sources are arranged alphabetically according to the last name of the author, or the publication. Since most of these sources are in English, I will only indicate those sources in Hebrew, with a *Heb*. at the end of the listing.

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Glossary of Terms and Abbreviations

A. Terms relating to *QU* (Quality-Utility)

Term	**Definition**
QU (Quality-Utility)	An entity (material or non-material) that provides benefit to man by satisfying his needs and wants and increasing his well-being and/or ability to function in this world.
MQU (material *QU*)	*QU* that is carried on or part of a material object, from where it can be consumed for benefit, usually leaving behind discarded matter in the form of wastes. *MQU* is the part of an object which brings benefit to man.
NQU (non-material *QU*)	*QU* which is not carried on matter or energy, which provides benefit to man. I have expressed *NQU* as knowledge and righteousness.
PC (productive capacity)	The capacity to produce new *QU*, in excess of what the producer of *QU* needs for its own maintenance or growth. *PC* is the reverse of degradation.
MPC (material productive capacity)	Capacity for producing *MQU*. *MPC* includes the production of what are called 'ecosystem services[744]' such as ecosystem stability, and is often linked to 'producers' who utilize photosynthesis for producing food and other benefits.
NPC (non-material productive capacity)	Capacity for producing *NQU*. Man produces *NQU*, and this production is often a function of his level of education and intellectual and moral-ethical development.
Negative QU	The opposite of *QU*. *Negative QU* degrades the *QU* of other objects it comes into contact with. For example, heavily polluted water carries negative *QU* which can cause the degradation of water or other objects coming into contact with the polluted water. *Negative QU* can usually be neutralized with the input of sufficient *QU* - such as knowledge and energy.

B. Other Terms

HQFW – High Quality Fresh Water – water that meets drinking water standards for purity.

[744] See section 4.1.6.C for a description of 'ecosystem services'.

Summary

Bal Tashchit: The Jewish prohibition against needless destruction

Bal tashchit, a Biblical prohibition against needlessly destroying resources, is possibly the most important religious principle directly relating to the relationship between man and his environment. While the extensive environmental destruction the world has witnessed over recent history has sparked increasing interest in 'religious' responses to environmental issues, and has made the relevance of *bal tashchit* greater than ever, a clear and comprehensive description of the principle of *bal tashchit* has been lacking. Also lacking has been an analysis of how *bal tashchit* might actually be applied to current environmental problems.

Towards addressing these deficiencies, this thesis attempts to answer three basic questions: 1) what exactly is *bal tashchit*? 2) How might a principle of *bal tashchit* be applied to current environmental problems? 3) What contributions might the principle of *bal tashchit*, as analyzed and clarified in this thesis, make to the world?

In answering these questions, this thesis first examines the classic texts in the Jewish tradition from which *bal tashchit* is derived. The source-text (Deuteronomy 20:19-20) is analyzed and shown to contain important symbolism concerning the relationship between man and his environment (chapter two). The legal prohibition of *bal tashchit*, which developed from the source text, is examined from a chronological perspective before being clearly defined according to the Jewish tradition (chapter three).

Drawing from the above research as well as from modern western concepts, this thesis describes a wider and more universal principle of *bal tashchit* that can serve as an approach to the management of current environmental problems (chapters four and five). This principle places a great deal of importance on the intellectual and moral-ethical development of man, which is seen as a key factor in the proper management of the natural environment. Included in this principle is a hierarchy for the allocation of resources in a way that will avoid needless destruction, and maximize human welfare in a sustainable way.

As a theoretical approach to the management of current environmental problems, the principle of *bal tashchit* is applied to the recurring water crisis in the land of Israel, and more peripherally, to the problems of climate change and loss of biodiversity (chapter six).

The principle of *bal tashchit*, as presented in this thesis, can contribute to our understanding of the relationship between man and his physical environment, and how to live sustainably without sacrificing quality of life.

Samenvatting in het Nederlands

BAL TASHCHIT: het Joodse verbod ter voorkoming van onnodige vernietiging

Bal Tashchit (BT), het halachische (Joods-wettelijke) verbod om onnodig natuurlijke hulpbronnen te vernietigen, is waarschijnlijk het belangrijkste religieuze principe dat betrekking heeft op de verhouding tussen de mens en zijn omgeving. Hoewel de vernietiging van de omgeving, die vooral in recente tijden plaats vindt, ook in andere religieuze groeperingen interesse heeft gewekt – waardoor BT actueel is geworden – ontbreekt er een duidelijke definitie van het principe van BT. Wat ook ontbreekt is een analyse hoe BT gebruikt kan worden voor de behandeling van de huidige problemen op ecologisch gebied.

Deze dissertatie stelt zich ten doel om antwoord te geven op drie fundamentele vragen:

1. Wat wordt precies verstaan onder BT?

2. Hoe kan BT toegepast worden op huidige ecologische problemen?

3. Wat kan de bijdrage zijn van het principe van BT, zoals dat geanalyseerd wordt in deze dissertatie, tot een leefbare wereld?

Om antwoord te geven op deze vragen wordt eerst de tekst in het Oude Testament waarop BT gebaseerd is, onder de loupe genomen. Deze tekst (Deuteronomium hoofdstuk 20, vers 19-20) blijkt een belangrijke symboliek in te houden betreffende de relatie tussen de mens en zijn omgeving. Dit wordt in hoofdstuk twee van de dissertatie behandeld. In hoofdstuk drie wordt het halachische aspect van BT bekeken vanuit een chronologisch perspectief waarna het wordt gedefinieerd volgens de joodse traditie.

Op grond van het in de eerste drie hoofdstukken beschreven onderzoek wordt met behulp van moderne westerse opvattingen uit onder meer de geneeskunde, de natuurkunde en de economie in de hoofdstukken vier en vijf BT als een universeel principe geformuleerd, dat kan helpen moderne ecologische problemen op te lossen. BT is gebaseerd op de intellectuele en ethische ontwikkeling van de mens en moet worden gezien als de belangrijkste factor in het op de juiste manier omgaan met de natuurlijke omgeving. Dit principe impliceert een hiërarchie voor het gebruik van natuurlijke hulpbronnen op een wijze die onnodige vernietiging voorkomt en tegelijkertijd het welzijn van de mens op een optimale, blijvende manier bevordert.

In hoofdstuk zes is het principe van BT toegepast op de waterhuishouding in Israël en is het probleem van klimaatverandering en verlies van bio-diversiteit aangetipt.

Het principe van BT, zoals dat in deze dissertatie wordt gepresenteerd, kan een bijdrage leveren tot het begrijpen van de verhouding tussen de mens en zijn fysieke omgeving en het mogelijk te maken om op langere termijn te leven zonder af te doen aan de kwaliteit van de leefomgeving.

Curriculum Vitae

Keith A. Wolff was born in Ft. Lauderdale, Florida, in the United States on 7 July, 1957. After graduating from Northeast High School, in Ft. Lauderdale, in 1975, he received a B.S. in Soil Science from the University of Florida in 1981, and worked for the United States Soil Conservation Service in central Florida. In 1988 he received an M.A. in Energy and Environmental Studies from Boston University. He also helped design and implement recycling programs in Boston, Massachusetts and New York City before moving to Jerusalem, Israel in 1989, where he studied in a number of Jeshiwoth (Talmudic Academies). From 2000, he was the research director and later, the director of the Environmental Responsibility Unit of the Jerusalem Center for Business Ethics. He has also taught courses in Environmental Management at the Jerusalem College of Technology. He is married to Claire and the father of eight children.

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Declarations

1. An important, and often overlooked aspect of *bal tashchit* is the protection of human life and health (pp.57, 66-67, 71, 115-116 of thesis). *Bal tashchit* also proscribes unnecessarily harming animal life (p.57-60 of thesis).

2. Unlike what David Nir claims, *bal tashchit* can be legitimately expressed as a general and wide-ranging principle (p.3 of thesis).

3. Approaching the 'Hebrew Bible' without the Jewish oral tradition, as codified in the Talmudic literature, leads to very different interpretations and conclusions about *bal tashchit* (p.7 of thesis).

4. *Bal tashchit* is a situation-dependent principle. In times of scarcity, *bal tashchit* is less relevant. In times of abundance, *bal tashchit* becomes more relevant.

5. *Bal tashchit* prohibits only the *needless* destruction of resources. This necessarily implies some form of a hierarchy or prioritization of human needs according to which any destruction can be gauged as needless or justified.

6. The principle of *bal tashchit* is based on a different set of underlying assumptions (Appendix A.) and a different system of thought (p.4-5 of thesis) than those which are prevalent in the modern western world, in spite of many similarities in approach (see chapter six, and chapter seven, p.195).

7. Jewish tradition is neither anthropocentric, nor ecocentric, but rather theocentric. Man is considered more important than nature because his role is to complete and perfect the creation (p.76 of thesis).

8. In this time of environmental interest, there should be more emphasis on the ecology-oriented writings of Rabbi Samson Raphael Hirsch (1808-1888).

9. The environmental approach of the Netherlands is consistent with many of the ideas of the principle of *bal tashchit* as presented in this thesis.

10. The Ehrlich-Holdren equation of I = P*A*T is seriously flawed, in that it does not sufficiently take into account the ability of humans to innovate and improve (Appendix C, p.224, 228-229 of thesis).

11. Halawi dates protect against arteriosclerosis better than the Medjool dates, though both are beneficial. Therefore, people should eat more dates. (M.Aviram *et al(?)*, J Agricult Food Chem, *in press).*

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Leiden, 1 December, 2009